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COMPUTERWORLD

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Mac-to-go weighs in as big hit

BY JAMES DALY
CW STAFF

UNIVERSAL CITY, Calif. — It was not hard to guess that Hollywood was right down the road.

With lasers, lights and smoke bombs working overtime, Apple Computer, Inc. bounded off in two directions at once last week as it unveiled its long-awaited Macintosh Portable and the high-end Macintosh IICI.

The product introductions are the most significant Apple rollouts since the unveiling of the Macintosh SE more than two years ago and mark important additions to the popular Macintosh family.

In recent years, attractive low-end DOS laptop computers from companies such as NEC Corp., Zenith Data Systems, Toshiba Corp. and Compaq Computer Corp. have left Macintosh users howling for an equal. Apple Chairman John Sculley admitted that he wanted to deliver a laptop a year ago, but problems perfecting the sophisticated screen

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AD/Cycle starts uphill climb

BY ROBERT MORAN
CW STAFF

Users and observers characterized IBM's AD/Cycle announcement last week as long on strategy and short on deliverables but said they were relieved that the wait for the repository will end in June 1990.

In theory, AD/Cycle, IBM's applications development strategy for Systems Application Architecture environments, provides a framework for users to improve the productivity and manageability of their applications development — a process that has long been bogged down by applications backlogs that exceed five years at many large sites.

The backlog of applications has been growing faster than a company's ability to automate, according to Sam Albert, an independent consultant in Scarsdale, N.Y. "Anything that IBM can do to automate that process will in turn reduce the application development backlog for organizations and result in industry revenue," Albert said.

The applications life cycle ranges from business modeling and requirements analysis to

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Development cycle

Key components of IBM's AD/Cycle available during the next nine months

Product	Availability
Repository Manager/MVS • Manages application development information in AD/Cycle; DB2 Version 2, Release 2 serves as information storage and retrieval facility	June '90
Query Management Facility • Version 2, Release 4 supports retrieval from Repository Manager and query support for DB2 distributed database	December '89
Interactive System Productivity Feature • Provides MVS support for OS/2 workstation tools	Q1 '90
Cross System Product • Version 3, Release 3 supports application definition on a workstation	June '90
CSP/370 Runtime Services • Generates VS Cobol II application programs for IBM environments	June '90

CW CHART: JOHN YORK

Open systems group wavers on AIX

BY AMY CORTESE
CW STAFF

The status of IBM's AIX as the basis for an industry-standard Unix operating system may be in trouble. With a month to go until its first scheduled delivery of the OSF/1 operating system, the Open Software Foundation is contemplating reducing AIX's role in the final product and bringing in other software technologies.

OSF's choice of AIX as the foundation for its Unix offering was the topic of endless industry debate last year, forcing the group to defend AIX's "technical superiority." However, sources reported that OSF is aggressively investigating the Mach operating system, developed at Carnegie-Mellon University, to provide functionality lacking in AIX. An OSF spokeswoman confirmed last week that OSF is investigating the Mach kernel, among other technologies, to potentially integrate into the AIX offering.

The spokeswoman conceded that introducing new technology

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Insurers wary of image risk

BY MICHAEL SULLIVAN-TRAINOR
CW STAFF

After running pilot projects that predicted a 30% productivity gain, Scott Kania, a Cigna Corp. business executive, is going live this month with a $2 million image processing application.

Kania's project is expensive as new systems go, but it requires more than a monetary risk. The application will dramatically change the way 66 Cigna employees do their jobs, require redeployment of key personnel and automate the benefits administration process.

But it is still a small-scale risk, typical of image processing applications in insurance. While they benefit the division involved, they fail to provide a

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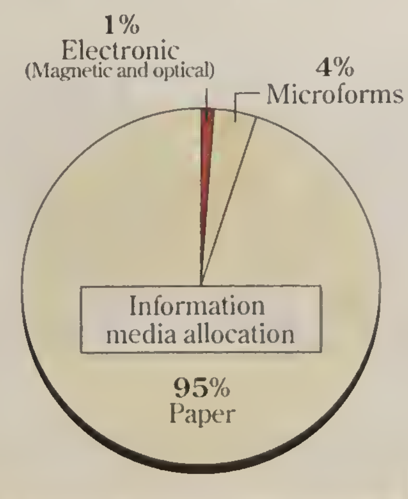
Hold onto those erasers

Electronic media storage use by end users is relatively insignificant



SOURCE: TEMPLE, BARKER & SLOAN, INC. RESEARCH STUDY FOR AIIM

What remains of Cullinet?

CA mum on reports of firings, slashed projects

BY NELL MARGOLIS
CW STAFF

WESTWOOD, Mass. — The reality of Computer Associates International, Inc.'s acquisition of Cullinet Software, Inc. set in last week for customers wondering what will be left of product support and for hundreds of employees left wondering where they will next find work.

CA declined to quantify the massive reduction in jobs that began within hours of the official closing of the takeover two weeks ago and was wrapped up last week.

Reports from several sources close to Cullinet, however, placed the figure in the 650 to 700 range. In addition, according to the sources, an estimated 200 people — "a lot of them in development" jobs — left the company between the June announcement of the Computer Associates buyout and the deal's early September closing rather than wait to let CA decide their fate.

Meanwhile, the future of some of Cullinet's most promising recent product offerings appears far from certain. The official CA white paper issued by the new owner immediately after the buyout implied that all Cullinet lines will be maintained and supported, but layoff patterns and unofficial reports that

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NEWSPAPER

SECOND CLASS

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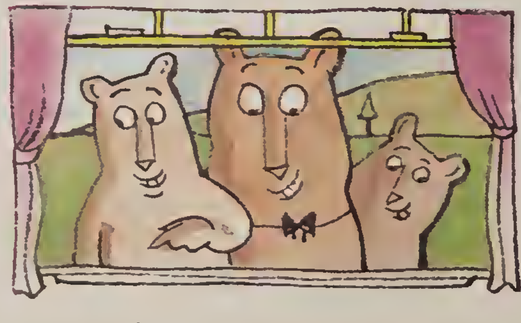
UPDATE

Wizard of OS. A telephone poll of 175 large PC sites by International Data Corp. reveals some unflattering trends for OS/2. Speculation and uncertainty about the operating system prevail with very little ongoing third-party development work, while user familiarity with the software wanes. Plans to standardize on OS/2 somehow keep getting pushed deeper and deeper into the next decade, the report finds, with about one-third of those polled saying they'll never standardize on it. The only OS/2 applications making any hay in the marketplace are OS/2 versions of the old DOS applications. DOS extenders, anyone?

Learning the beverage business is a must for Cadbury Schweppes systems developers. Page 65.

JOYCE RAVID



Too big, too small, or just right? Evaluating jobs for document imaging. Page 107.

EXECUTIVE BRIEFING

■ **Computer imaging's bright potential** is dulled by slow acceptance in the insurance industry, considered a prime candidate for the technology. The big problem is the lack of a demonstrable payback that management demands. As a result, imaging is largely in the pilot stage, and no insurer has yet made the move to use it to competitive advantage. **Page 1.** The cost justification for imaging won't necessarily come from paper reduction but from more flexible information handling. The more complex the application, the better imaging looks. **Page 107.**

■ **IBM sketches an application development** road map, announcing the long-awaited repository for use in modeling enterprises and how they use information. Users are relieved to finally get a look at IBM's plans, but they question whether AD/Cycle's environment goes far enough. **Page 1.** Another concern is the central role of IBM's Cross System Product as an SAA application generator. The new CSP sports a nicer interface, but it's still a bit player in the market. **Page 140.**

■ **Our annual Hardware Roundup:** While the Intel I486 chip and EISA bus were making the papers in '89, the hidden story was the upheaval in the structure of the PC market. IBM, Compaq and Apple still rule the roost in the elite class of high-end systems, but IBM's market share is shrinking. The middle tier of the PC market has pretty much washed away, and a large commodity segment has emerged, dominated by players who compete on price. Low-cost clone manufacturers are doing all they can to differentiate themselves to survive. **Page 69.** Architectures, not products, are what users are looking for in the small systems market, and they're seeing triple: IBM, DEC and RISC. **Page 91.**

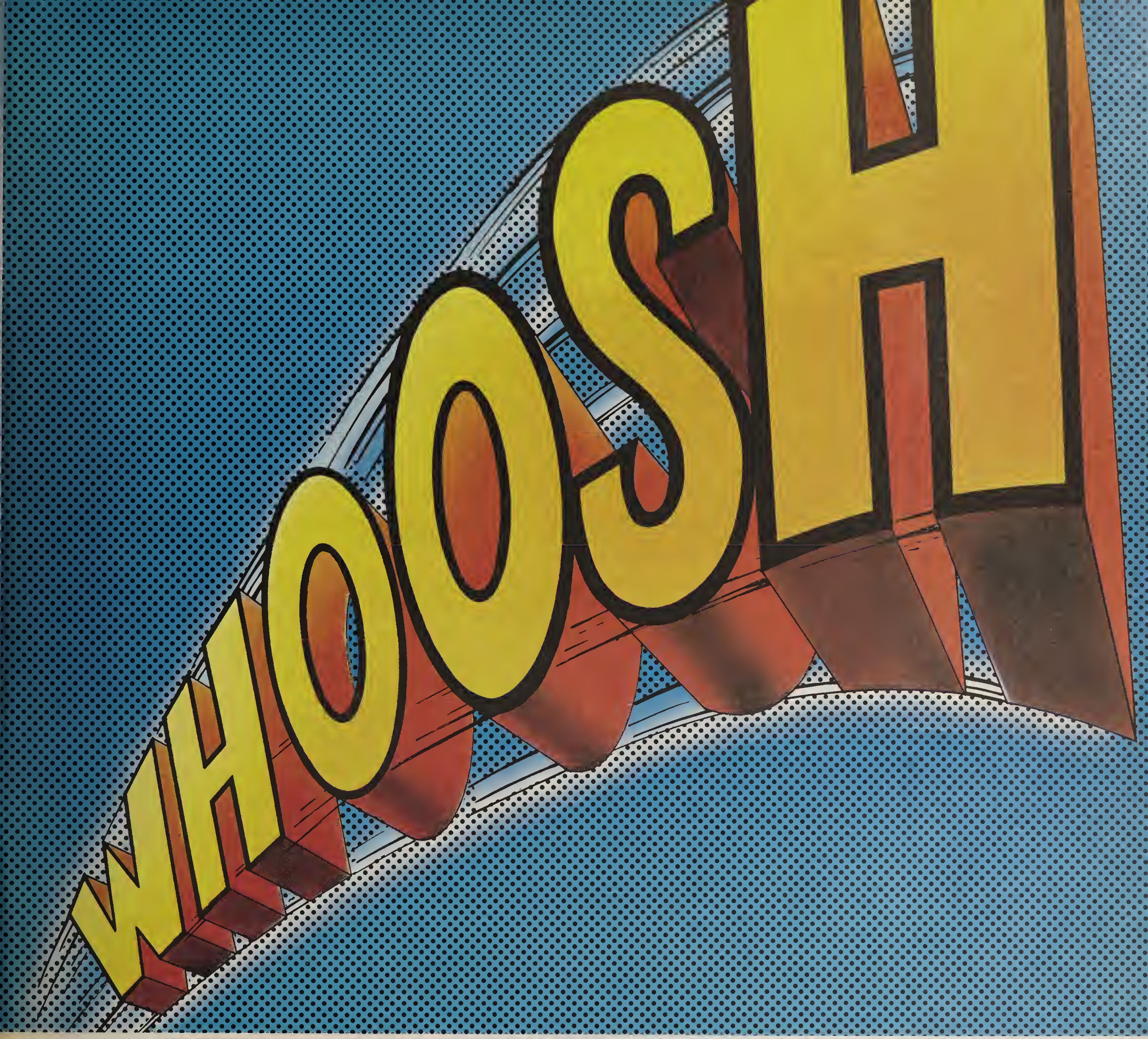
■ **Don't talk tech** when you're involved in a business review at the firm of Cadbury Schweppes. The company requires new IS employees to spend at least a couple of months immersing themselves in the business. Only after they understand how the firm operates can they suggest ways to apply computers to the process. **Page 65.**

■ **Network servers may gain favor** as serious application vehicles if a report commissioned by Microsoft and Ashton-Tate is correct. The independently audited benchmark says that the companies' SQL Server is capable of running transaction-class applications. **Page 35.**

■ **Workstations reach the magic price point** and begin to compete with PCs. As the first sub-$4,000 Unix workstation hits the market, attracting user interest, many believe the critical mass of applications software may soon follow. **Page 4.** Meanwhile, the Intel I860 chip is taking its lumps for some overblown early Intel performance claims. Observers now say that the chip is not CPU material and will probably live as a coprocessor. **Page 25.**

■ **Computer Associates moves quickly** to swallow Cullinet. Gone are most Cullinet executives, a banking software development project and about 850 employees. Left in limbo is Cullinet's successful Enterprise:Generator system. CA is expected to release a paper next week detailing plans for the absorbed Cullinet products. **Page 1.**

■ **On-site this week:** Expert systems are available round the clock to help Wendy's troubleshoot equipment problems. **Page 39.** The New York public school system pilot tests a database and computer network that will someday maintain central records on more than a million students. **Page 25.** Brouter, can you spare a dime? Laclede Gas goes with a cross between a bridge and a router to combine flexibility with low cost. **Page 53.**



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IS execs not quite in the front row

BY CLINTON WILDER
CW STAFF

NEW YORK — Although substantial progress has been made, information systems chiefs in most corporations still fall short of full-fledged membership in the executive suite of top management.

That was the consensus of IS executives and consultants at *Business Week's* second annual Symposium of Information Executives last week.

William Atkins, director of Touche Ross & Co.'s IS consulting practice, compared the IS executive to a rookie who has made a pro football team but is not a key member of the starting lineup.

"He's on the team without a playbook," Atkins said. "The problem is that in most companies, the playbook is not written. It's a general understanding of 'the way we do things around here.' "

Atkins noted that while other business disciplines such as marketing, accounting and engineering have been practiced for centuries and have developed established cultures, IS management of any kind is less than 40 years old. Many companies have had difficulty according such a new discipline equal status with traditional department heads.

Prudential's MacKinnon

However, the speakers from the IS executive community, many of whom are considered to have achieved that status in their companies, stressed that IS executives cannot wait for the invitation from senior management.

"Act like a business executive, not someone who's only in charge of IS but has an enterprise-wide view of the company," said James Freeman, senior vice-president of Cigna Corp.'s Cigna Systems unit. "You have to be able to go to your peers and not ask what you can do for them, but say there's something you intend to do in IS and you need their support."

Several executives said that IS executives have a huge role to play in helping their companies adapt human resources to the major demographic changes taking place in the work force. The demands for technical proficiency and so-called knowledge workers are increasing at the same time that the labor pool is shrinking and becoming increasingly foreign-born.

"We in IS need to help design the jobs that people will fill," said Malcolm MacKinnon, senior vice-president at Prudential Insurance Co., the nation's largest insurer. MacKinnon noted that when IS moves developers into a firm's business units, it should ensure that there is a technical career path within that unit if the developer does not want to move to another function.

PC, workstation firms prepare for price war

BY MICHAEL ALEXANDER
CW STAFF

The makers of workstations and personal computers are headed for a shootout that promises to make the gunfight at the OK Corral look like a walk in the park.

The entry-level price of workstations has fallen dramatically this year to the point at which some models sell for less than similarly configured PCs.

Market leader Sun Microsystems, Inc. has not been able to keep up with demand for its low-cost Sparcstation 1, a Unix workstation offering 12.5 million instructions per second (MIPS) that was introduced in April, according to the company. The $8,995 workstation packs such PC features as a graphical user interface — Sun and AT&T's Open Look — and optional software to run MS-DOS applications.

But the honor, if there is one, of being the least expensive workstation to debut thus far goes to the new Series 2500 workstation introduced two weeks ago by Hewlett-Packard Co.'s Apollo Division.

At $3,990, the entry-level 2500 is priced some $700 to $2,000 less and offers better performance than personal computers made by Apple Computer, Inc. and Compaq Computer Corp., said John Thompson, senior product manager for personal workstations at Apollo (see chart). It is also approximately two-thirds the price of an entry-level Sun 3/80 and nearly half that of a Digital Equipment Corp. Vaxstation 3100, he said.

The workstation, which runs at 4 MIPS, is aimed at corporate customers who have wanted the processing power and networking capabilities of a workstation but previously were unable to pay the premium, Thompson said.

The market has reached its "magic price point," at which customers will begin to seriously consider workstations instead of personal computers, especially for use in distributed computing environments, said Michael Millikin, vice-president at Seybold Office Computing in Boston.

"I think that trend is already beginning," Millikin said. "As you come down to the $4,000 price, it is an acceptable entry point that will open a lot of doors."

So far, corporate customers have shied away from buying workstations instead of PCs, partly because PC software leaders Lotus Development Corp., Ashton-Tate Corp. and Microsoft Corp. have yet to introduce workstation equivalents of their best-selling software.

Unix needed

"As workstation prices come down, it will be important for independent software vendors to include a Unix platform in their development," Millikin said. "I would guess that within a year, we're going to see some very nice Unix workstation applications."

The graphical interfaces of Apple's Macintosh and Microsoft Windows for PCs have made using PCs less traumatic for millions of end users. No such widely accepted graphical interface exists in the workstation market, where end users must cope with the often arcane commands of Unix.

"Now, PCs have better accessibility than Unix workstations, but that won't be for long," said Andrew Allison, editor of the "RISC Management Newsletter," based in Los Altos, Calif. He predicted that PC power users will step up to workstations with the wider availability of Unix-metaphor software such as HP's New Wave for workstations.

The average price of a workstation has nose-dived at a rate of 20% per year, according to Dataquest, Inc.

The San Jose, Calif., market research firm said worldwide sales rocketed from about $2.7 billion in 1987 to $4.1 billion in 1988, a stunning annual growth rate of 52%.

A rose by any other name...

The flimsy lines of distinction between workstations and personal computers were ground into the dust with HP's recent release of a new Apollo system

Apollo *DN2500*	Compaq *Deskpro 386/20E Model 40*	Apple *Macintosh IIx*
68030 chip (20MHz)	80386 chip (20MHz)	68030 chip (15.7MHz)
68882 chip (20MHz)	No coprocessor	68882 chip (15.7MHz)
4M-byte memory	1M-byte memory	1M-byte memory
15 in. monochrome monitor 1,024- by 870- pixel resolution	Monochrome monitor	15 in. monochrome monitor 640- by 870- pixel resolution
$3,990	$4,699	$5,897

CW CHART FRANK C. O'CONNELL

CORRECTIONS

Andrew T. Eiseman was incorrectly listed as information systems executive at US West in the Sept. 11 *Computerworld Premier 100* supplement. Winston J. Wade, a vice-president, is president of the company's Information Technology Group.

Information on Systonetics, Inc.'s Ezpert Release 5.5 software that was listed in the Systems & Software section [CW, Sept. 11] was drawn from outdated literature and is not relevant to the company's current product line.

The limited free upgrade program for users of IBM's Advanced System/400 cited in "IBM rekindles AS/400 flame" [CW, Sept. 11] applies exclusively to customers who have an AS/400 Model B30 or B40 or Total System Package-equivalent Model P30 or P40 on order before Oct. 27 and installed between Sept. 5 and Dec. 29.

In the Product Spotlight chart on Digital Equipment Corp. maintenance providers [CW, Aug. 28], ABS Associates, Inc.'s telephone number should read (312) 577-7752.

In the Hardware Roundup medium-scale systems chart [CW, Sept. 18], Honeywell Bull should read Bull H. N. Information Systems, Inc.; in the large and medium-scale systems chart, Prime Computer, Inc. provides end-user and value-added reseller distribution.

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CRS may attract nonairlines

BY CLINTON WILDER
CW STAFF

Electronic Data Systems Corp. will be the first nonairline to own an airline reservation system if its reported negotiations to buy Texas Air Corp.'s System One subsidiary come to fruition. But it may not be the last.

According to published reports last week, financially strapped Texas Air, parent of Continental Airlines and strike-crippled Eastern Airlines, is negotiating to sell the U.S.' third-largest computerized reservation system (CRS) to EDS.

Both companies refused to confirm the negotiations, but EDS spokesman Roger Still said his company is aggressively trying to expand its business beyond processing for parent General Motors Corp.

Future fad?

Outside ownership of a CRS may be the wave of the future, said Jim Needham, national director of Ernst & Young's tourism and hospitality consulting practice in Seattle. Pending antitrust legislation sponsored by Sen. Howard Metzenbaum (D-Ohio) could require airlines to sell their CRSs or spin them off as independent units because Metzenbaum believes they give the owner an unfair competitive edge.

Meanwhile, the U.S. Department of Transportation launched a broad inquiry last week to determine whether regulations pertinent to airline CRSs should be strengthened to prevent abuses.

The proceeding was triggered by a series of complaints and petitions from the American Society of Travel Agents and Texas Air, which argued that various clauses in the five-year contracts between CRS vendors and travel agents are stifling competition.

"It could be a good strategic move for EDS," Needham said. "What they're really buying is the network, which could provide synergies to other segments of the tourism business."

EDS has deep pockets as well as a will to expand, said Stephen McClellan, computer services industry analyst at Merrill Lynch & Co.

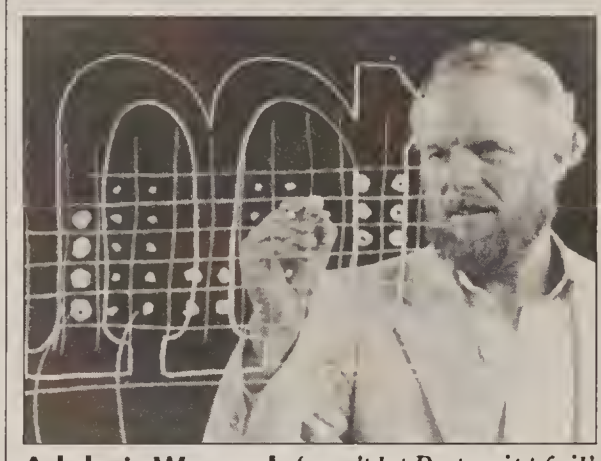
"I would assume it's going to happen," he said. "They have several hundred million in cash to spend on acquisitions, and they know what they're doing in transaction processing. They can do the processing more efficiently and get more profitability out of it."

Users to reap benefits of Postscript

BY JEAN S. BOZMAN
and CHARLES VON SIMSON
CW STAFF

SAN FRANCISCO — Users should not be concerned about the effects of last week's dramatic confrontation that pitted Apple Computer, Inc. and Microsoft Corp. against Adobe Systems, Inc., industry analysts said.

Apple and Microsoft have combined to develop their own page-description language, but Microsoft said its font standards will be compatible with Adobe's. Users may soon be able to pick and choose which they want. The forceful competitive blow to Adobe, which developed the Postscript page-description language, means that a new printing standard will emerge, analysts predicted.


Adobe's Warnock *'won't let Postscript fail'*

Within hours of the announcement, Adobe Chief Executive Officer John Warnock parried the move, announcing that he would "open up" Postscript by publishing many of its specifications. The news came just a month before Adobe starts shipping its new ATM page-description series for the Apple Macintosh.

"If Adobe didn't open Postscript up now, someone else would have forced them to do it," said Herb Edelstein, a partner at Euclid Associates in Berkeley, Calif.

Until now, Adobe has been the unquestioned market leader in desktop publishing, capturing the lion's share of the market. Its fonts are used by most major computer hardware vendors, including IBM, Hewlett-Packard Co. and Apple and by the biggest names in printing, including Compugraphic and Varityper.

However, some Postscript clones were already beginning to emerge as third-party firms elaborated on the published portions of the Postscript standard. "Before this, we had no open standards. Now, we have two," said Cheryl Rhodes, editor of the "Bove & Rhodes Report on Desktop Publishing."

Nick Donofrio, president of IBM's Advanced Workstations Division, declined to state his position on the Apple/Microsoft conflict with Adobe. "We are very much in support of Adobe Postscript," Donofrio said, noting that IBM makes extensive use of Postscript for output from both large and small systems. "It's a fundamental underpinning for that industry segment."

However, because IBM's desktop Personal System/2 runs OS/2, the new Apple/Microsoft standard will, by default, be on IBM machines.

Microsoft's Gates *warms up to Apple's fonts*

Apple CEO John Sculley and Microsoft CEO Bill Gates kicked off the dispute with an announcement last Tuesday that they would make Apple's new Outline font technology and Microsoft's new printer software standard across Apple's Macintosh and Microsoft's OS/2 Presentation Manager platforms. The new Apple standard would, they said, be compatible with Adobe's Postscript.

"We chose to license Apple font technology because it was the best there was," Gates said.

By Wednesday morning, the Apple/Microsoft move led to visible anger on Warnock's part, who addressed the Seybold Computer Publishing Conference here, along with Gates. His voice cracking with emotion, Warnock told the Seybold gathering of 1,000 that the Apple standard would ruin his dream of a single, global standard for printing. "What I heard today is the biggest bunch of garbage and mumbo-jumbo I've ever heard in my life," Warnock said. "Adobe Postscript is so important to the publishing industry that I'm not going to let it fail."

Warnock asked for support in presenting Postscript to the international standards committees as a global standard. "The desktop publishing industry has been built by the people in this room. It certainly hasn't been built by Bill Gates," he said.

Steve Jobs, CEO of Next, Inc., was the first to defend the concept of a single page-description language. "Bill is trying to get more revenue for Microsoft. That's great," Jobs said, as Gates listened nearby. "But there's absolutely no new technology here."

The Apple/Microsoft move comes several months after Apple severed its long-standing relationship with Adobe and a month before Adobe plans to ship its Adobe Type Manager for the Macintosh.

"ATM was to be Adobe's preemptive countermove to the ability of Microsoft and Apple to do outline font processing," said Paul Zagaeski, a senior analyst with The Yankee Group in Boston. With outline technology, he said, letters are generated mathematically, reducing the need for multiple font files describing different type sizes.

AIX

FROM PAGE 1

at this late date would set back the planned rollout of the operating system, slated to start with the delivery of a vendor kit next month. But she maintained that general availability, originally scheduled for July 1990, will still come in "the second half."

Late release

The disclosure comes amid growing speculation that IBM is having problems bringing its latest release of AIX to market as scheduled. IBM has indicated that it may announce new workstations running AIX in the first quarter of next year. However, the announcement was widely expected to come next month.

Another OSF official disclosed last week that a letter was being sent to members to inform them of the investigation of Mach and to request feedback. A decision will likely be made at the next member meeting, to be held in early November, at which time the OSF staff will present a revised plan, he said.

The decision to look beyond AIX is in response to feedback from members that certain functionality lacking in the product is desired in the 1990 time frame, such as full multiprocessing capability and high-level security, the OSF spokeswoman said.

Unlike most Unix variants, Mach was designed with multiprocessing in mind. Release 3 of AIX, on the other hand, will have multiprocessing enabling capabilities but will not have the necessary code in that release, the OSF spokeswoman said.

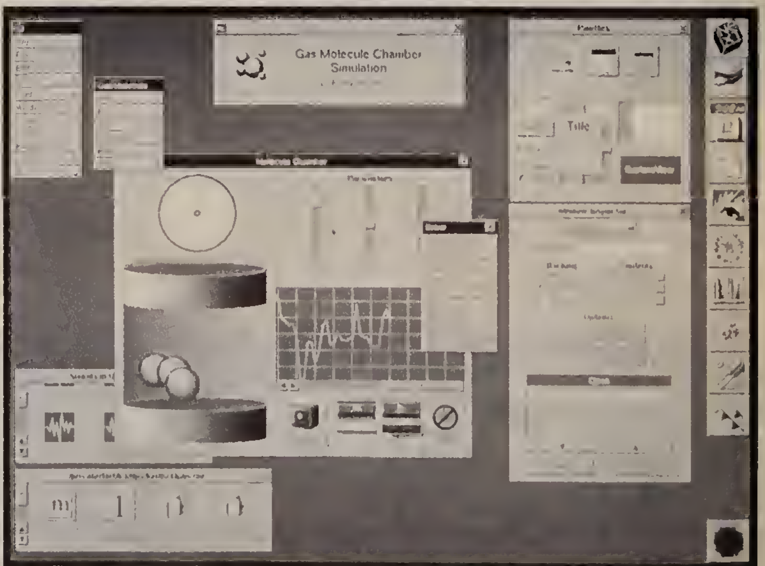
Mach's inherent multiprocessing capabilities and clean design have captured the interest of many organizations in the Unix industry, including IBM, which has helped fund Carnegie-Mellon's research. The operating system was cast into the limelight earlier this year when Next, Inc. based its much-publicized workstation on it.

"Multiprocessing has become a prinicipal requirement" for Unix and is not planned for the next version of AIX, said William Filip, assistant manager for Personal Systems at IBM, last week. "Mach has always been on the horizon as a potential for that but was considered fairly immature. The view is that that is changing, and Mach is becoming more realistic to integrate."

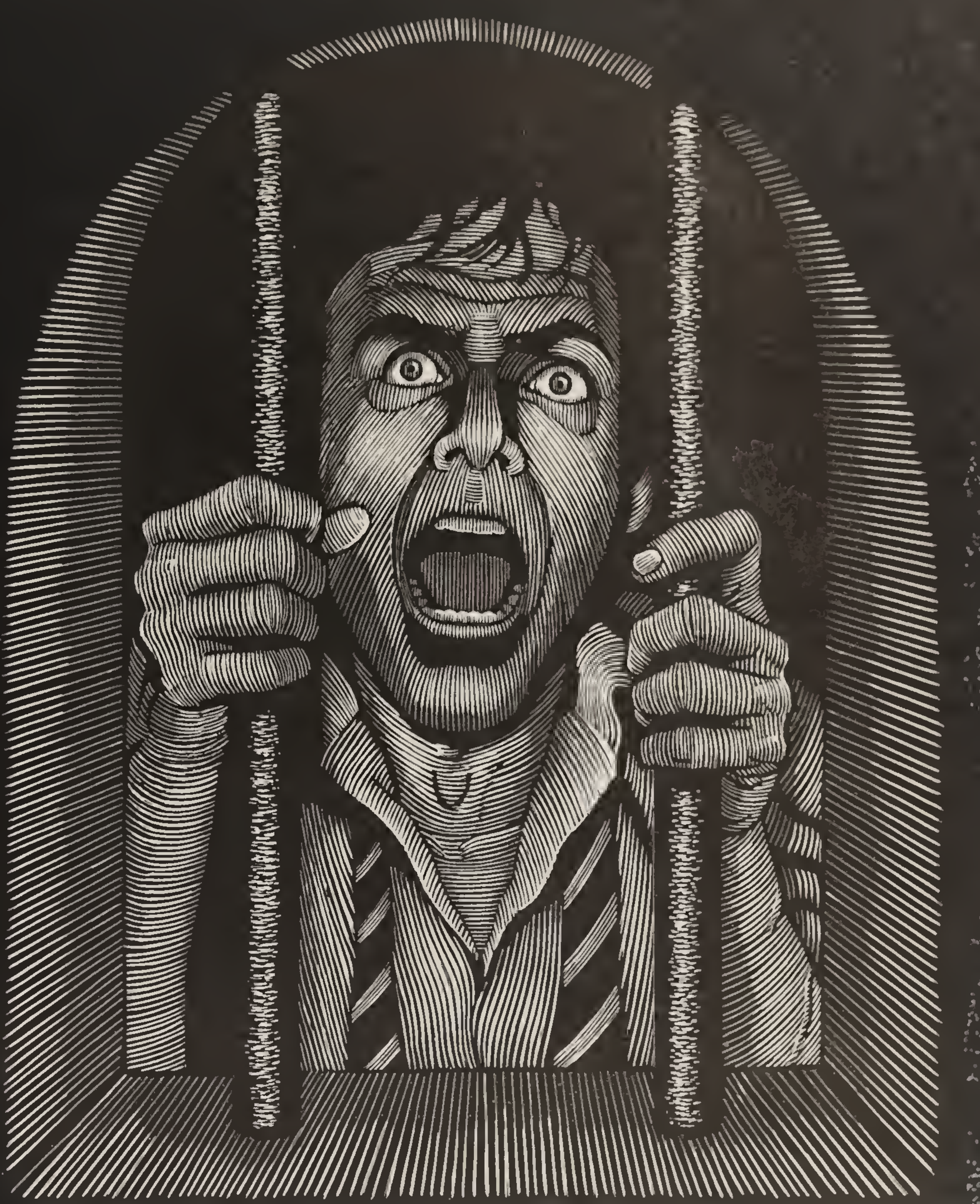
Filip conceded that when Release 3 was licensed to OSF, it was expected to be completed earlier than is believed now; however, IBM did not have any expectations about how much would be incorporated by OSF, he said.

He said he did not believe the delay was a factor in the decision to evaluate Mach.

The Next step



Next, Inc.'s operating system *shipped last week, 11 months after the company's workstation was unveiled. Interface Builder, utilized in the screen shot above, is included in the interface to the system's Mach version of Unix.*



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Agenda

8:30	Registration and coffee	10:15	Break
9:00	Seminar begins	12:00	Free lunch

Seminar dates and locations

Atlanta, GA
November 17

Boston, MA
October 12

Cherry Hill, NJ
October 31

Chicago, IL
October 6

Cleveland, OH
October 4

Dallas, TX
November 15

Denver, CO
November 7

Detroit, MI
November 14

Hasbrouck Heights, NJ
October 11

Hartford, CT
October 20

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November 9

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October 5

Kansas City, MO
November 8

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October 25

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October 19

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A-CWX-890925

NEWS SHORTS

NAS Europe off the block

After at least eight months of negotiations with National Advanced Systems (NAS) owners Hitachi Ltd. and Electronic Data Systems Corp., West Germany-based Comparex Informations Systeme GMBH abandoned plans to buy NAS Europe. Last week, NAS said the European division was no longer for sale. Comparex, Hitachi's largest distributor in Europe, said the deal was supposed to be made for $200 million. It announced that discussions were terminated Sept. 15. Soon to be known as Hitachi Data Systems, NAS "will operate as a global company," a spokesman said.

……

CIO tapped at Veterans Affairs

President Bush has nominated Edward G. Lewis to serve as assistant secretary for information resources management at the U.S. Department of Veterans Affairs. Lewis was previously director of management support services for the Bush-Quayle campaign in 1988 and held a variety of management posts involving strategic planning in the U.S. Marine Corps.

……

Protest lodged on Air Force pact

Martin Marietta Corp. has filed a protest with the General Accounting Office that challenges a $164 million contract recently awarded to Honeywell, Inc. If successful, the move could also deal a blow to subcontractor Apple Computer, Inc., which has agreed to supply the U.S. Air Force with up to 80,000 Macintosh computers. Martin Marietta's bid included supplying Sun Microsystems, Inc. workstations.

……

Delta seeks partners

Delta Air Lines is forging ahead in its efforts to merge its computer reservation system (CRS) with others. In June, Delta and AMR Corp., parent of American Airlines, canceled the proposed merger of Delta's Datas II and American's Sabre when told it would be contested in court by the U.S. Department of Justice. However, last week, Delta, Northwest Airlines and Trans World Airlines announced that the three are discussing the establishment of a jointly owned, independently operated, neutral CRS for travel agents.

……

White House erasures challenged

Private groups such as the National Security Archives research organization have the right to challenge a White House decision to erase computer tapes, said U.S. District Judge Charles Richey in a Sept. 15 ruling. The decision permits the research organization's lawsuit, which claims that electronic mail messages of the Reagan White House should be preserved as historical records [CW, Jan. 30], to move toward a trial.

……

High-tech hospital display planned

The "Hospital of the Future," a showcase of health care information technologies, checked into the Dallas Infomart last week. The center, due to open next May, is the latest demonstration of systems integration know-how by Chicago-based systems integrator Andersen Consulting, which is sponsoring the center along with the American College of Healthcare Executives. Andersen has already set up systems integration labs for the manufacturing and retail industries. The $5 million permanent exhibit will feature devices and systems from 20 different vendors and will stress open-architecture interconnection, including the developing Hospital Level-7 protocol based on the Open Systems Interconnect model.

……

Ely joins venture group

Veteran computer industry executive Paul Ely has been named a general partner of the Menlo Park, Calif.-based venture capital firm Alpha Partners. Ely, who recently retired from Unisys Corp., had been chief executive officer of Convergent Technologies, Inc. until it was acquired by Unisys in 1988. He also spent 22 years at Hewlett-Packard Co.

HP unpacks LAN Manager Unix port

BY PATRICIA KEEFE
CW STAFF

Hewlett-Packard Co. moved a step closer to uniting Unix and DOS-based file systems when it shipped LAN Manager/X (LM/X), a Unix port of OS/2 LAN Manager, to Microsoft Corp. last week.

According to Microsoft, OEMs can expect to receive their ports imminently, which means users could see related third-party products as soon as early 1990.

Users are having "nightmares" trying to manage and find data located in different databases spread across multiple platforms, claimed Eric Wasiolek, manager of distributed Ingres product marketing at Relational Technology, Inc. (RTI), which has endorsed LM/X.

Building LM/X into database file servers will let users create a logically centralized system with respect to file management. This would provide DOS users with a DOS perspective for files regardless of where they are, even though many are located on Unix machines, Wasiolek said.

Having completed its contractual work for Microsoft, HP said it has begun limited delivery of HP LM/X software running under its HP 9000 Series 800 and 300 technical computers, with volume shipments slated for December. Support for both Unix System V, Release 3 and HP/UX is provided.

Named Pipes support

Also shipping now is HP LM/X/OS/2, said to provide full Named Pipes support for both DOS and OS/2 clients. A version for HP's Unix- and Intel Corp. 80386-based Vectra will be released in the first half of 1990.

Besides RTI, three other major desktop database vendors — Oracle Corp., Informix Corp. and Sybase, Inc. — have endorsed LM/X. According to Stamford, Conn.-based Gartner Group, Inc., the four firms account for 85% of the relational database market for Unix systems.

Meanwhile, much to Microsoft's evident chagrin, HP made two related announcements.

First, it is negotiating a sublicensing agreement with Microsoft that would allow HP to also offer its LM/X port to OEMs. Traditionally, Microsoft retains the OEM sales from its dealings with development partners. In addition, Microsoft will not bundle Transmission Control Protocol/Internet Protocol (TCP/IP) into LAN Manager, as planned.

Microsoft does not comment on contract negotiations, said Mike Murray, Microsoft's marketing director of the networking business.

The sublicensing talks were prompted by a slight twist to the LM/X port. OEMs and users could conceivably have their choice of two Unix LAN Manager ports. This is because Microsoft acquiesced to AT&T's decision to bypass HP's Unix port to build one of its own.

According to Duncan Campbell, marketing manager at HP's Colorado Networking Division, there is concern that the appearance of two LM/X standards ports will "confuse the hell out of the market." Microsoft denies this but did agree that the three companies are working to ensure interoperability.

Campbell said Microsoft "kicked out" TCP/IP software, which was developed months ago for Microsoft by Excelan, Inc. Instead, a reference letter from Microsoft will direct interested OEMs and users to HP for TCP/IP under LM/X, he claimed. "There is no letter and no announcement at this point," Murray said.

Thomas Watson Jr. honored, voices concerns

BY NELL MARGOLIS
CW STAFF

AUSTIN, Texas — Thomas J. Watson Jr. didn't wear a red "power tie" to the American Electronics Association's (AEA) awards dinner last Tuesday night.

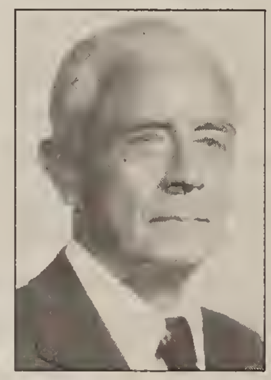
He didn't have to.

The 70-year-old chairman emeritus and former chief executive officer of IBM was honored as the 1989 recipient of the AEA's Medal of Achievement last week.

"I had very great luck at the IBM company — not only in picking the right father but in picking some very fine people to work under me," Watson told a crowd that delayed his acceptance speech by several minutes with a standing ovation.

"If I had it to do over," he quipped, "I probably couldn't find a company my father was the head of."

His humor-laced observations, however, turned serious and even grave as he voiced, both from the podium and in a later interview, disturbing doubts about the future of the technology industry and the competitive stance of the U.S. in the global market.


Watson: *Threat is a failure of will*

In reviewing Watson's 34-year career at IBM, AEA President and CEO J. Richard Iverson noted that he "never lost sight of the fact that motivated people are the most important asset of any business venture." He still believes it, Watson told *Computerworld*, but he harbors uncertainties as to where the country's industrial motivation is coming from today and whether it is sufficient.

"I don't know whether the U.S. is willing to make the sacrifices necessary to be the greatest nation in the world anymore," Watson said. He voiced sympathy for the effort to stay tax increases but added that eventually, the country may have to face up to tax hikes as the only route to raising necessary revenue without increasing an already precarious federal deficit. "The Japanese aren't always going to buy our bonds," he cautioned.

Watson numbered himself among the many who acknowledge that the U.S. is currently caught in an education crisis that, especially when coupled with the financial allure of fields other than technology, threatens the quality of our next generation of technologists. Were he in his 20s, embarking on a career today, Watson said, he would be hard put to resist the staggering starting salaries available on Wall Street.

"I'm not sure where America is headed," Watson said, acknowledging that the uncertainty is both new and disconcerting to him. "I've never before *not* felt that I've known."

He added that he strongly believes the most exciting and productive days for both the industry and the country lie ahead. The threat, he said, lies in a potential failure of the will — not the resources or ingenuity — to prevail.

On the world front, Watson, who served for two years as U.S. ambassador to the USSR, suggested that we finance a "Marshall Plan for Russia."

Without such financial backing, he said, Soviet Premier Gorbachev — whose inability to bring the ruble into accord with other national currencies threatens the viability of his sweeping socioeconomic reforms — could fail to maintain his power base, and we could witness the return of a USSR police state.

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[1] IBM Journal of SAA. [2] DATAPRO survey, August 1988, companies with sales over $10 million. [3] Donaldson, Lufkin & Jenrette report

U.S. CONFERENCES

AL	Huntsville	Oct 11*c* Nov 30*
AZ	Scottsdale	Oct 10*af* Nov 9
CA	La Jolla	Oct 19*f*
	Los Angeles	Oct 12*, 17*f* Nov 7*am*
	Newport Beach	Oct 26*f* Nov 16
	Ontario	Oct 3*f*
	San Diego	Oct 10* Nov 14
	San Francisco	Oct 26*cf* Nov 15*al*
	San Mateo	Nov 9*
	Santa Clara	Oct 19*fl* Nov 21*ac*
CO	Colorado Springs	Oct 24
	Denver	Oct 19*cf*
CT	New Haven	Oct 12*pa*
	Stamford	Nov 9*f*
DC	Washington	Oct 17* Nov 14*l**
FL	Boca Raton	Oct 18*f*
	Miami	Nov 9*c*
GA	Atlanta	Oct 17*f* Nov 15*c*
	Macon	Oct 10*c*
	Savannah	Nov 2*f*
IA	Des Moines	Oct 18
ID	Boise	Oct 12*l*
IL	Chicago	Oct 25*cf* Nov 15*fl*
	Springfield	Nov 16
IN	Indianapolis	Oct 17*a*
KS	Wichita	Oct 12
KY	Louisville	Nov 16*f*
LA	New Orleans	Oct 20*f*
MA	Boston	Oct 26*am*
	Worcester	Nov 1*p*
MD	Baltimore	Oct 17*c*
MI	Bloomfield Hill	Oct 10*fl*
	Dearborn	Nov 7*aa*
	Grand Rapids	Oct 12*f*
	Lansing	Nov 9*f*
MN	Minneapolis	Oct 11*ac* Nov 7*fm*
MO	Kansas City	Oct 3* Nov 8*f*
	St. Louis	Oct 10*ac* Nov 14*fl*
MS	Jackson	Nov 14*c*
NC	Charlotte	Oct 27*f*
	Res Tri Park	Oct 26*p*
NE	Omaha	Nov 14*f*
NH	Merrimack	Oct 4
NJ	Cherry Hill	Nov 14*f*
	Iselin	Oct 10*f* Nov 8*l*, 29*f*
	Saddlebrook	Oct 19*l*
NY	Albany	Oct 11*c*
	Buffalo	Nov 9*c*
	Melville	Oct 18*p* Nov 16*f*
	New York City	Oct 11*l*, 25*f* Nov 1a, 29*f*
	Rochester	Oct 19*c*
	Syracuse	Oct 18*f*
OH	Cincinnati	Oct 24* Nov 14*mpa*
OK	Oklahoma City	Nov 15*c*
OR	Portland	Nov 9*cf*
PA	Harrisburg	Oct 19
	King of Prussia	Oct 13*c*
	Philadelphia	Oct 24*f* Nov 7*f* Nov 28*a*
SC	Charleston	Oct 26*f*
	Columbia	Oct 19*c*
	Greenville	Oct 12*f*
TN	Memphis	Nov 28*
	Nashville	Oct 24*c*
TX	Austin	Nov 3*c*
	Dallas	Oct 1*i*#, 3*cf* Nov 7*fpa*
	Ft. Worth	Oct 16*f*
	Houston	Oct 19*fpa* Nov 16*cf*
	San Antonio	Nov 2*c*
UT	Salt Lake City	Oct 30
VT	Williston	Oct 19
WA	Seattle	Nov 1, 7*
WI	Madison	Nov 9
	Milwaukee	Oct 24*c*

The following key indicates additional afternoon seminars that are offered with these seminar dates:

a	*Macintosh Networking*
c	CASE/Application Tools
f	Oracle Financials
i	Oracle Int'l User's Group '89
l	Oracle Mail
m	Computer Integrated Manufacturing
p	PC Product Solutions
u	Unix

Please note:

*	Seminars held for Federal Government only.
#	Only the afternoon seminar is held that day

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Edmonton	Oct 12, 24 Nov 9
Halifax	Nov 15
Kingston	Oct 3
London	Oct 24
Montreal	Oct 24
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COMPUTERWORLD

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Nynex readies net management scheme

BY ELISABETH HORWITT
CW STAFF

TARRYTOWN, N.Y. — Nynex Information Solutions Group, Inc., the nonregulated arm of Nynex Corp., is expected to announce and deliver an integrated network management system early next year.

The as-yet-unnamed product will compete with the likes of IBM's Netview and AT&T's Unified Network Management Architecture (UNMA) for the strategic position of "manager of managers" in corporate networking environments. The Nynex offering is said to be designed as the focal point of the Open Systems Interconnect (OSI) network management model, which defines a central system to coordinate monitoring, diagnostics, configuration and data collection across different network management subsystems, said Gary Tjaden, executive director of integrated network management.

The product will interact with a variety of vendors' systems by supporting OSI protocols such as Common Management Information Protocol, as well as de facto standards such as Netview and UNMA, Tjaden said. Nynex will also develop proprietary links between the system and network systems that do not comply with OSI, he added.

Nynex's product will also be able to send commands to initiate testing and reconfiguration on network subsystems with that capability, Tjaden said. An object-oriented database will collect network statistics for later analysis.

By positioning its product as a manager of managers, Nynex will relegate other would-be centralized management systems such as Netview and UNMA to the status of "just another subnetwork," Tjaden said.

Nynex is also in the process of developing an expert systems component with the help of Polytechnic University's Center for Advanced Technology and Telecommunications, said Ivan Frisch, the center's director. The expert system will play the crucial role of analyzing an incoming flood of alerts and alarms from various parts of the network and determining the likely trouble source, he added. Nynex has given no time frame for when the expert system will become available.

AT&T tools control long-distance use

BY JOANIE M. WEXLER
CW STAFF

BASKING RIDGE, N.J. — AT&T relinquished more control of its long-distance network to customers last week by announcing additional network management tools that support the company's Unified Network Management Architecture (UNMA) strategy.

The offerings extend the firm's suite of Accumaster Network Management Services, which serve the UNMA long-distance domain, across six functions: configuration management, fault management, performance management, network planning, accounting management and security.

The expansion of existing capabilities to other AT&T long-distance services, coupled with the introduction of new network management offerings, furthers users' abilities to take charge of their own network destinies.

"Ultimately, most sophisticated users want complete control of their networks," said Mike Hurwicz, president of MTI Group, a communications consulting firm in Eastsound, Wash. "They don't want to wait to get their T1 links reconfigured or determine what their call expenditures have been. They want instant access to those things."

The new releases give users the following network management capabilities:

- Expansion of the existing Accunet Information Manager to support alarm information and network configuration for Accunet T45 and Accunet Spectrum of Digital Services with graphic displays (availability first half of 1990).
- Electronic traffic-data reports for Megacom, Megacom 800, Multiquest and 800 Validator services, in addition to previously supported Software Defined Network (SDN) service (immediate availability).
- On-line, near-real-time, inbound/outbound call detail data for SDN, 800, Megacom, Megacom 800 and Multiquest services (availability first half of 1990).
- Electronic bill delivery for private-line and SDN services (immediate availability).
- An option to AT&T Detail Manager providing customized billing reports for Megacom, WATS and 800 customers (availability fourth-quarter 1989).
- Reports highlighting potential fraudulent SDN usage through the Network Remote Access Monitoring System (immediate availability).

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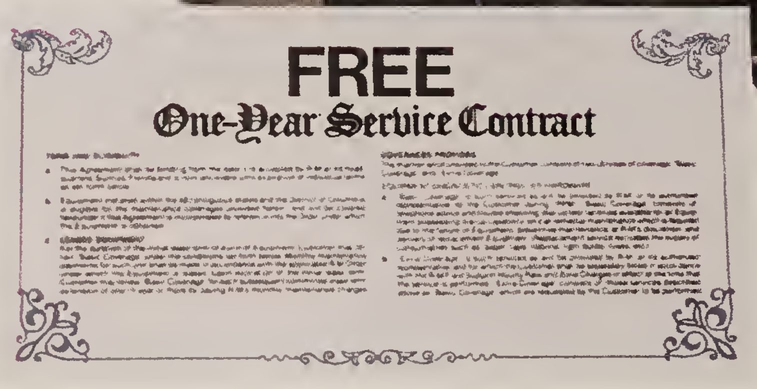
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CA liquidates Cullinet banking group

BY ELLIS BOOKER
CW STAFF

OAKBROOK TERRACE, Ill. — The ax has yet to fall officially on Cullinet Software, Inc.'s next-generation integrated banking system. However, Cullinet's new owner, Computer Associates International, Inc., has already essentially dismantled the group responsible for development and support of the product, firing all but a select few of the 70 to 80 employees in its center here, *Computerworld* has learned.

According to a source with close ties to Cullinet's office, pink slips were handed out to most of the development and software support employees. Of the 10 or so remaining workers, four have been assigned to other duties, the source said.

"We have no comment regarding any specific numbers or offices," said a CA spokesperson at the company's Westwood, Mass., offices when questioned about the reported layoffs. However, the spokesman said that the largest percentage of cuts made throughout Cullinet's worldwide work force were administrative and added that CA does not "anticipate any reduction in service or support for new or old clients."

CA also repeated an earlier promise to deliver "position papers" on Cullinet's manufacturing, human resources and banking products, in that order, sometime in the future.

Bank automation analysts were not surprised by the move to shut down Cullinet's operation. They said Cullinet's embryonic product claimed only a few beta-test sites, while CA already has a commercial banking product called Infopoint. CA bought into the banking industry when it acquired the former Uccel Corp. in 1987.

Top-ranked firm

The firm ranks in the top three among independent suppliers of banking software along with Kirchman Corp. in Orlando, Fla., and Hogan Systems in Dallas, according to M. Arthur Gillis, president of Computer Based Solutions, Inc., a New Orleans-based bank automation consultancy.

Apart from the CA acquisition of Cullinet, Gillis said he did not believe the banking software was viable.

The Cullinet product "is brand new in a mature market," Gillis said. "A business does not grow on the basis of three sites."

The most prominent of those test beds was Exchange National Bank in Chicago.

In a short statement issued last week, Exchange National said it was "deferring implementation" of the Cullinet banking package, which the bank began beta testing in August 1987 and hoped to put into service next quarter.

Computer Associates and the bank are talking, a bank spokeswoman said, adding that CA has said it would support the Cullinet system should the bank move to deploy it.

What remains?

CONTINUED FROM PAGE 1

circulated last week suggested otherwise.

By midweek, the vaunted Cullinet banking system support group had been virtually dismantled (see story above).

Moreover, there were indications that a similar fate awaits what several analysts have referred to as "the crown jewel" of Cullinet's tool kit, the Enterprise:Generator (formerly known as Knowledge Build).

"An enormous brouhaha broke out over the Generator technology," said a source close to Cullinet. "CA thought that it was too leading-edge." Several sources close to CA characterized the company as loath to involve itself in far-reaching development efforts and missionary marketing.

"Their style is to buy products that are already well-known, with well-established customer bases that they can sell into," one source said.

According to a source close to Cullinet, approximately 25 members of the 90-person Enterprise:Generator development team were let go last week.

Most significantly, perhaps, the Cullinet vice-president who headed the generator development group, Ron Zambonini, reported to work last week as vice-president of development at Ottawa-based Cognos, Inc.

"The three best assets we had were the banking system, the application generator and the Cullinet identity," said a former Cullinet manager. "CA is getting rid of all of them."

Users hope they will not be kept in suspense for long. At Cullinet User Week in Atlanta next week, CA reportedly plans to release a second white paper that will detail its product-line plans. In the meantime, a tentative mood prevailed.

"There has been a lot of concern about support and future enhancements," said Pedro Silva, supervisor of database and operations services at Blue Bird Body Co., a school bus and luxury motor coach manufacturer in Fort Valley, Ga.

Silva said the white paper recently sent out by CA "appears to indicate they will continue to grow IDMS, especially with SQL" capability but noted that he had heard "no mention" of CA's plans for Cullinet's application software products.

However, James D. Herrick, manager of systems technology at Peabody Holding Co. in St. Louis, is not willing to wait and see CA's game plan for Cullinet.

Saying he was frustrated with Cullinet's lack of support for the VM portion of his mixed VM/MVS environments, Herrick said he has decided to move his database, now IDMS, to IBM's DB2. "Over the next three or four years, we're getting out of IDMS," said Herrick, whose company put IDMS on-line in 1980.

Midwest correspondent Ellis Booker contributed to this report.

Executive offices empty

As was widely predicted, CA's pink-slip delivery began in Cullinet's executive suite. Founder and Chairman John Cullinane, President Robert K. Weiler, Executive Vice-President John B. Landry III and Vice-President of Marketing Jeffrey Papows, all of whom remained through the transition, are divorced from Cullinet as of last week.

Cullinane

Papows last week became vice-president of worldwide operations at Ottawa-based software vendor Cognos, Inc.

Landry, often called Cullinet's technology guru, will now operate under his own flag. Agility Systems, a self-funded software start-up launched by Landry last week, is developing what he called "mail-enabled systems" that will wed database and business application software to large interconnected electronic mail networks. Weiler, Landry's longtime colleague, will sit on the Agility board.

Weiler, according to several sources close to Cullinet, will also serve as president and chief operating officer at Cambridge, Mass.-based desktop publishing company Interleaf, Inc. Weiler was unavailable for comment.

Cullinane will realize his often-voiced wish to return to his entrepreneurial roots. "I'm forming a company to pursue and invest in new business opportunities in emerging technologies," he told *Computerworld*.

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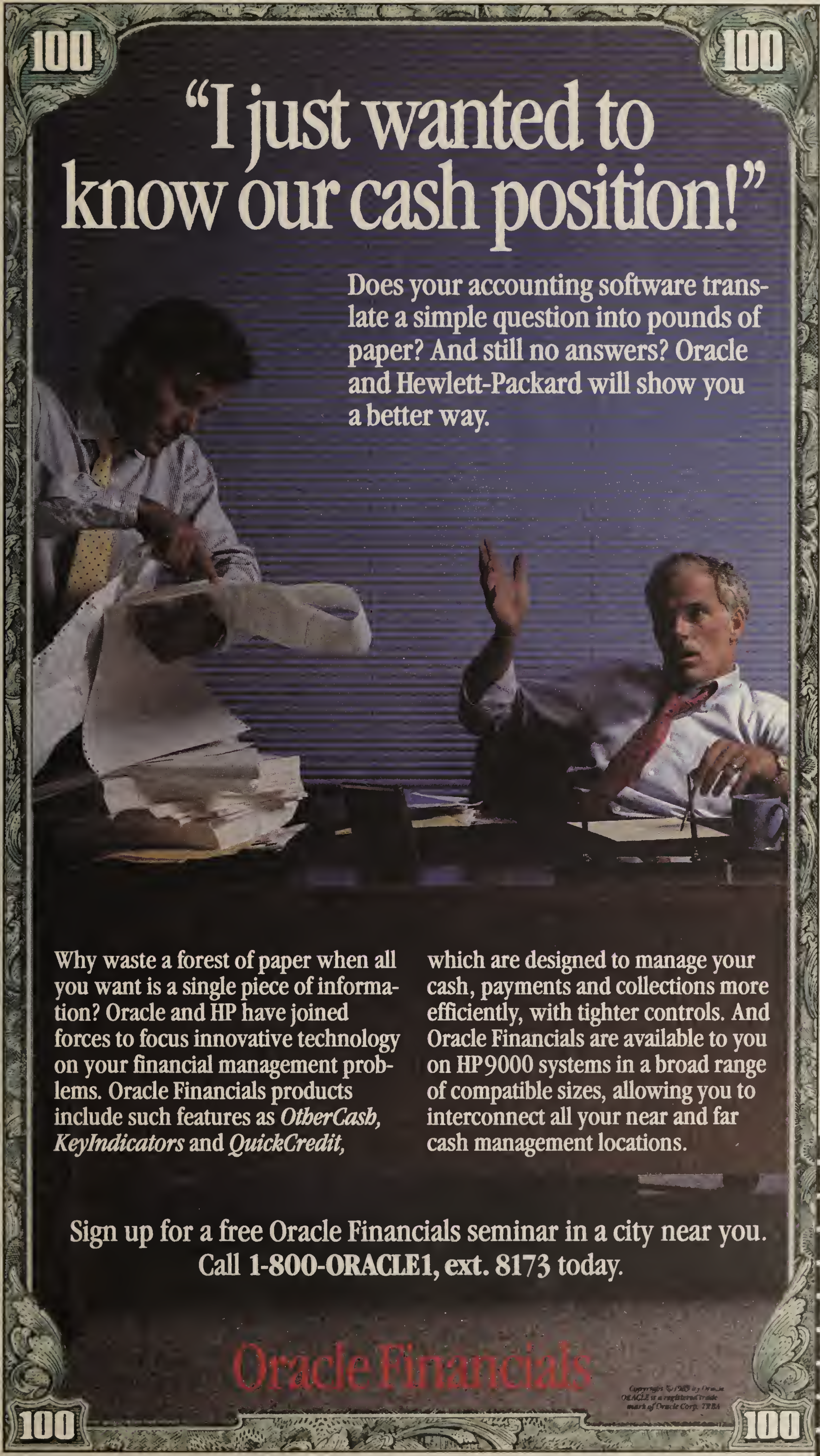

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Insurers wary

FROM PAGE 1

competitive advantage for the company as a whole.

Although there is the potential for such an advantage through the widespread use of image technology, the insurance industry is proceeding only with relatively small-scale imaging prototypes.

This slow progress is the case, even though early results from the pilot projects predict 30% to 50% productivity gains. "Our clients will notice increased responsiveness almost immediately," said Kania, assistant director of defined benefits administration at Cigna's group pension division.

But there is no widespread implementation. "Despite successful implementations in the last three or four years, image processing is still being viewed as experimental technology because the decision-making process is still very much on a traditional payback and cost savings" basis, said Mark Bruneau, who recently completed a study of the early implementors of imaging for consultants Temple, Barker and Sloane, Inc.

Gradual adoption

Further evidence of the discrepancy between imaging's current gradual adoption and its potential in the insurance field is market research statistics that show that the $350 billion industry spent only $60 million on the technology last year. Yet consultants predict that the insurance market for imaging will grow to $800 million by 1993.

At one time, analysts predicted that imaging in all vertical categories would be a $10 billion industry by 1990. Today, they estimate the market will total $6.8 billion by 1993, and only if vendors help users solve difficult implementation issues such as integrating imaging with existing systems.

The lack of large-scale investments in imaging in insurance and other industries is also evident in the continued financial struggles of Wang Laboratories, Inc., which is betting its future on image processing. The company is targeting insurance, among other areas. Wang's average installed system supports only 20 to 25 workstations, although the company can support much larger installations, according to Roger Sullivan, Wang's imaging products program manager.

Other major vendors clearly see an opportunity in imaging, but they are only beginning to provide products. IBM just entered the field last year and acquired minority stakes — totaling $10.3 million — in Image Business Systems and I/Net in June. However, the company has announced only two imaging applications in insurance, where the vendor dominates most of the computer installations. The largest — USAA in San Antonio — is only 13% installed.

New York Life Insurance Co. is considering a bid to be the first company to attain broad competitive advantage through imaging. John Foy, vice-president of customer service, is trying to convince senior management that an approximately $10 million customer service imaging application will provide the organization with an advantage. The application would save several million dollars per year and provide faster service, according to Foy.

"We intend to be the first with this scale of application," Foy said. "It may be a short-lived advantage, but if someone else does it first, we would be at a disadvantage. We're not waiting for them."

TRW, Inc., acting as a systems integrator, and IBM are vying for New York Life's proposal, which Foy said he believes would reduce processing time and cost and get policy information into customers' hands more quickly than the competition.

New York Life executives will have to make a "leap of faith" if Foy's project is to become a reality. In a time when companies are reluctant to make major capital investments, senior executives are steering clear of such uncertain judgments.

"We can foresee the opportunity to save money over five years over the way we handle paper today," said Tom Pettibone, senior vice-president in charge of information systems at New York Life. "But it's very difficult to quantify. What is the value of improved customer service?"

The reluctance of executives to approve expensive projects promising intangible benefits is one of the major problems with implementing imaging; traditional cost-justification techniques do not work, nor do small pilots. The only way to find out if imaging is for real is to implement it on a large scale and allow business processes to change along with it, according to users and consultants.

Cigna's Kania
expects changes

A single image processing workstation can be obtained for $10,000, but consultants recommend a minimum of $150,000 to $500,000 be invested in software, hardware, networking and applications development to achieve the benefits of the technology.

"The cost of the technology is still high enough that if you're looking for a payback, you have to spread it out over a large number of users," said Barry Cinnamon, an image processing consultant based in Upper Montclair, N.J.

Starting small

Rather than take the risk of spending millions on a large application, companies are continuing to experiment by implementing small projects while waiting for another firm to move first. Although the pilots are not revealing the anticipated benefits of large-scale applications, they are helping companies learn about how imaging changes the work process. This knowledge will be vital if companies are forced to catch a competitor who attains competitive advantage with the technology.

"If we're profitable now, why risk money for what may be a marginal improvement in profit?" said Robert Appel, a systems consultant at Allstate Insurance Co. "If we simply wait and do nothing, other people will risk the money, and it will take us no longer than six months to catch up."

Companies such as Allstate are looking very closely at USAA, the largest imaging application in insurance so far. Some 1,500 people, many of them insurance executives, have participated in IBM-sponsored tours of the new system.

So far, some 300 workstations are up and running for a property and casualty policy services application that will involve 1,400 workstations.

By using the system, USAA expects to save $5 million per year in support staff, space for paper files and supplies. It costs approximately $5 million a year to operate the system, said Charles Plesums, director of image systems at USAA.

Meanwhile, at Cigna, Kania is completing a shakedown of his application, which runs on a Wang VS and interacts with the company's IBM mainframe. Like many of those running image applications, Kania said he hopes that his project will inspire the rest of the company and prove the intangible benefits of the technology.

"This is a very large prototype," he said. "It's a model for the rest of the company."

Image of success?

Despite early successes in small-scale projects, image processing is still not seen as a mainline technology, according to consultants and users.

The reasons for the slow movement of imaging are similar to those confronting the implementation of many of today's emerging technologies, according to a white paper soon to be released by Nolan, Norton & Co. They include the following:

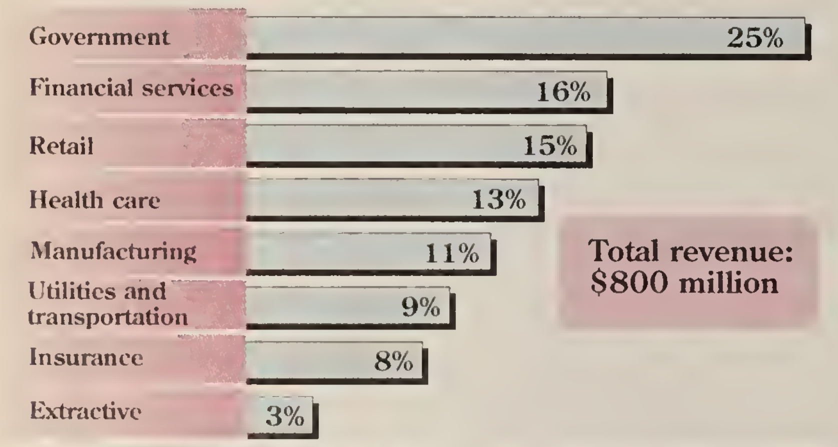
- Traditional cost-justification techniques. These rely on automating existing systems rather than quantifying new ones, preventing companies from investing in the technology because there is no documented payback.
- The requirement to change the work process. Imaging affects the entire work environment and, as in Cigna's case, requires new procedures, as well as the redeployment of workers.
- Lack of knowledge. Imaging applications fall outside the experience of nearly every information systems manager today because the technology has only recently matured to facilitate large-scale processing.
- The difficulty of integrating the technology with existing systems and the expense of the major pieces of equipment required.

"The real benefits with imaging come not from automating existing work flows, but rather from changing existing processes," concludes the paper.

Changing the work flow in a multibillion-dollar firm is a daunting proposition, but the shake-up may be worth it. For example, in the insurance industry — where a 2% market share of any particular line of insurance is an exceptional success — regulations govern most competitive factors. Companies can differentiate themselves only through better customer service.

"The first companies that are able to use imaging to differentiate themselves on a broad scale will capture larger market share by providing faster, higher quality service," said Mark Bruneau, who recently completed a study of the early implementors of imaging.

MICHAEL SULLIVAN-TRAINOR



Multiple images

The market for electronic imaging in 1988 was widely dispersed among industries, with government soaking up the largest share

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PC card powers link to IBM mainframes

IBM Personal Computer users can now hook up to IBM mainframes at a full 64K bit/sec. using a combination of AT&T hardware and Digital Communications Associates, Inc. terminal emulation software.

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DCA concurrently announced a software package providing the same capabilities as DCA's existing IBM 3278/79 terminal-emulation and file-transfer software over either of those links.

The DCP side of the products may get more use initially than the ISDN capability because the proprietary protocol is now installed on approximately two million lines and runs on all of AT&T's major PBX lines, AT&T spokeswoman Sue Fleming said.

AT&T's BRI card will work only with AT&T switches until the standard is more fully defined, she added. Only AT&T's 5ESS central office switch and Definity Generic 2 PBX now support BRI.

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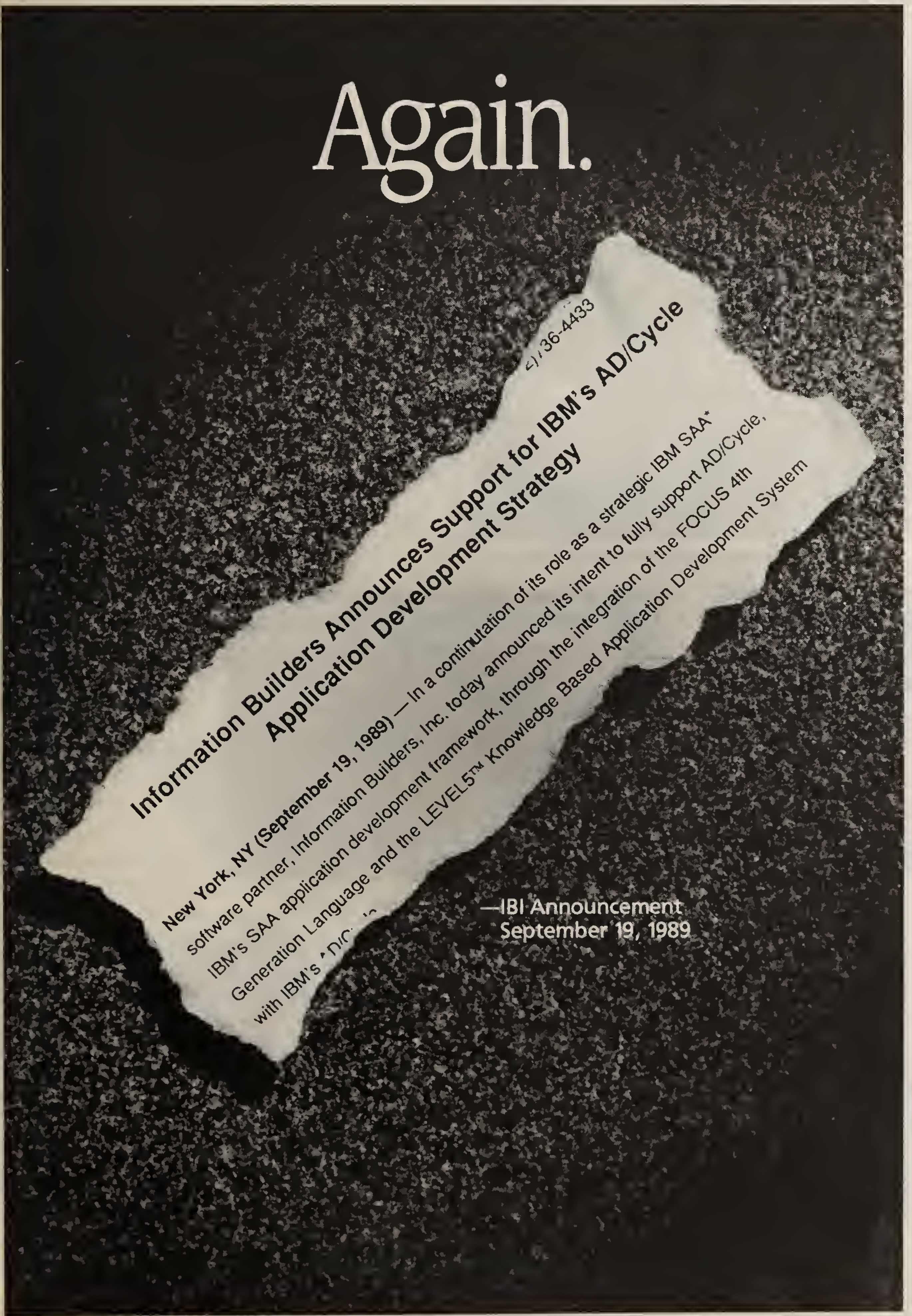

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Information Builders Announces Support for IBM's AD/Cycle Application Development Strategy

New York, NY (September 19, 1989)— In a continutation of its role as a strategic IBM SAA* software partner, Information Builders, Inc. today announced its intent to fully support AD/Cycle, IBM's SAA application development framework, through the integration of the FOCUS 4th Generation Language and the LEVEL5™ Knowledge Based Application Development System with IBM's AD/C

—IBI Announcement
September 19, 1989

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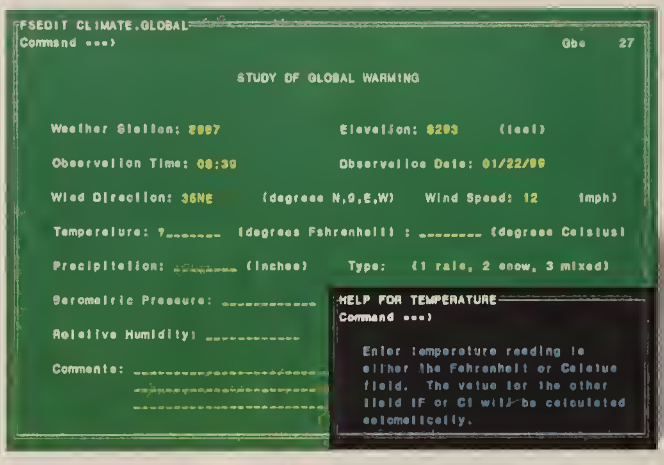

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FSEDIT CLIMATE.GLOBAL
Command ===>                                                     Obs     27

                        STUDY OF GLOBAL WARMING

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   Observation Time: 08:39               Observation Date: 01/22/89

   Wind Direction: 36NE      (degrees N,S,E,W)    Wind Speed: 12      (mph)

   Temperature: 7_______  (degrees Fahrenheit) : ________ (degrees Celsius)

   Precipitation: ________ (inches)      Type:   (1 rain, 2 snow, 3 mixed)

   Barometric Pressure: ____________  HELP FOR TEMPERATURE
                                       Command ===>
   Relative Humidity: ____________
                                          Enter temperature reading in
   Comments: ________________________     either the Fahrenheit or Celsius
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             ________________________     field (F or C) will be calculated
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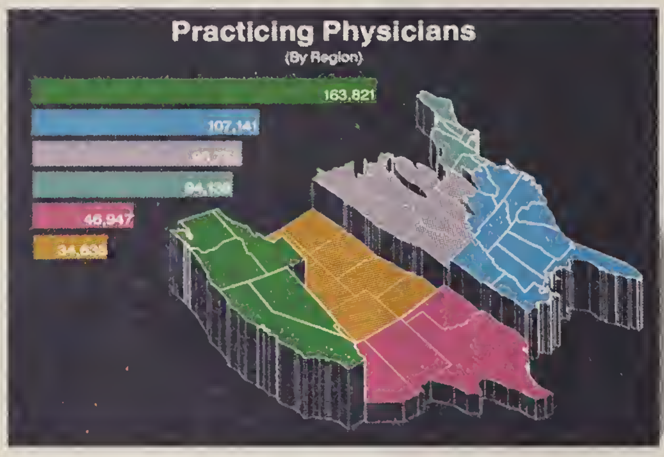

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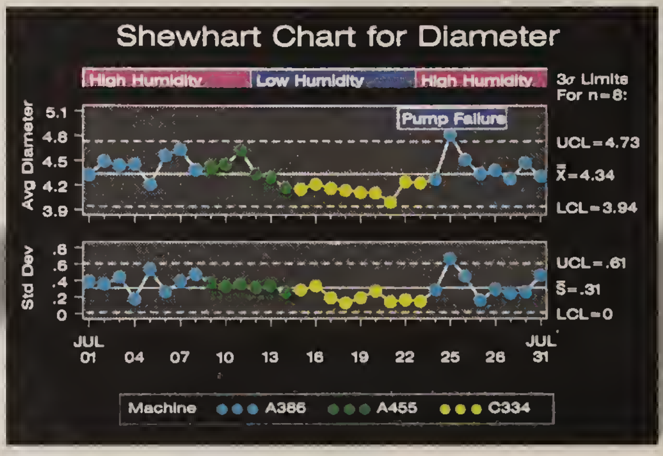

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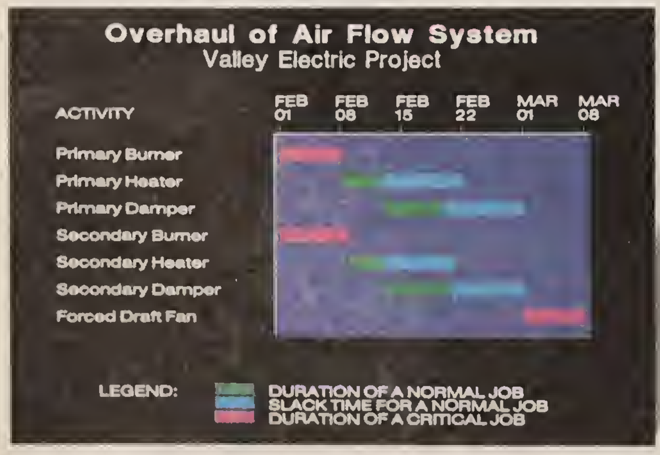

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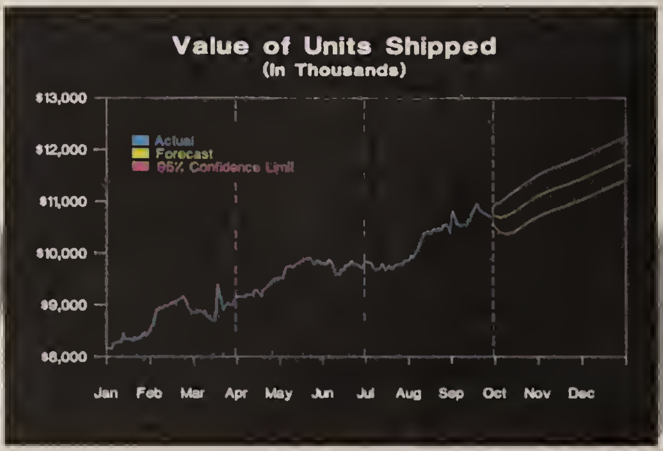

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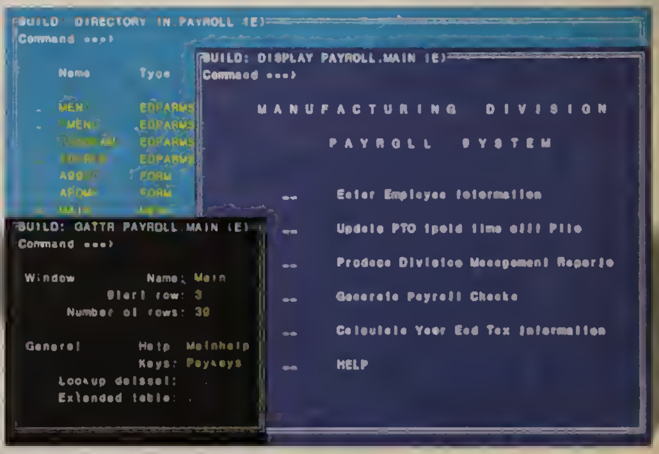

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BUILD: DIRECTORY IN.PAYROLL (E)
Command ===>

     Name          Type

   _ MENU          EDPARMS
   _ MENU          EDPARMS
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                   EDPARMS
     ADD           FORM
     AFORM         FORM
     MAIN

BUILD: DISPLAY PAYROLL.MAIN (E)
Command ===>

     M A N U F A C T U R I N G   D I V I S I O N

              P A Y R O L L   S Y S T E M

   __    Enter Employee Information

   __    Update PTO (paid time off) File

   __    Produce Division Management Reports

   __    Generate Payroll Checks

   __    Calculate Year End Tax Information

   __    HELP

BUILD: GATTR PAYROLL.MAIN (E)
Command ===>

 Window             Name: Main
              Start row: 3
         Number of rows: 30

 General            Help: Mainhelp
                    Keys: Paykeys
      Lookup dataset:
      Extended table:
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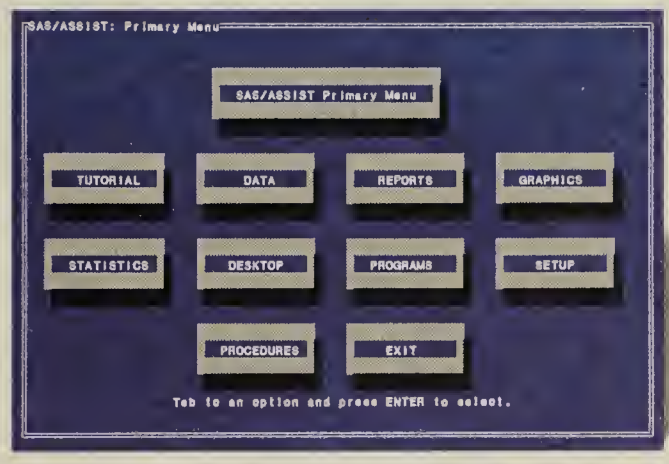

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EDITORIAL

Fund and games

EVER TRY JUGGLING Jell-O?

That's sort of what the federal government has been doing over the years in trying to define and implement a cohesive and consistent set of trade and domestic manufacturing policies relating to the computer business. The effort is daunting, the execution awkward and the results usually messy, even embarrassing.

This is not the fault of any particular administration or political party but rather the nature of the beast. Still, in its own way, the government muddles along, wondering why it never seems to get closer to its goal.

This month, the Bush administration took its first crack at Jell-O juggling, unleashing a policy designed to both prop up a badly ailing U.S. supercomputer industry and establish a national information network.

It is a very ambitious effort, which some are comparing to the science and R&D thrust supported by the feds three decades ago after the Soviets beat us into space with Sputnik. Bush's plan is a five-year effort carrying a price tag of $1.9 billion — about the price of three Stealth bombers.

Oh, yeah, there is one small catch: No one in Washington, including the president, will say whether there will actually be any money to pay for the program.

All the efforts to forge an active high-tech policy, including the current one, beg the question, "Do we really need one?" The correct answer is yes, and for at least two reasons.

The first is that governmental and quasi-governmental agencies in Japan have successfully stimulated and enriched the competitiveness of that country's computer industry. However, the most potent weapon deployed in this effort has not been restrictive import policies; instead, government-sponsored research and a secondary education system that ensures high-quality, uniform education throughout the country have fueled Japan's growth.

The second reason is the integrated European marketplace starting in 1992, which could well foster a self-sustaining parochialism. Already the European nations have imposed stiff tariffs onto U.S. semiconductor exporters, whereas formerly the chips entered the continent duty-free.

So, yes, a policy is needed. But what? Hasn't the record shown that the government's past trade and manufacturing policies resulted in higher prices and less selection for U.S. consumers?

The policy that *has* worked repeatedly is the one in which the federal government gets serious about funding all levels of education, from meal programs for needy first-graders to supercomputer R&D funding for universities. History has demonstrated that most other efforts to democratize trade and stimulate domestic output get gutted by political squabbling and pigging out at the pork barrel.

LETTERS TO THE EDITOR

Ad-monition

With the knowledge that an OS/2 Presentation Manager Extended Edition PS/2 and gobs of memory are required to run IBM SAA/CUA applications, I was wondering how the high workstation cost was going to be justified. It was therefore heartening to read MSA's back-page ad [CW, Aug. 28]. According to MSA, SAA/CUA helps to "maximize your investment in both personnel and hardware."

It's always nice to know how to maximize my investment. I wonder, however, how SAA will help to maximize my *return* on that investment.

Peter Eisch
Madison, Wis.

Advanced weapons

I must take exception to "High-tech weapons, low-tech GIs" [CW, Aug. 21]. This story does not reach your normal high standards for thorough research and balanced reporting. By changing the names and profession, the article could just as easily have been "High-tech offices, low-tech managers."

Whenever the user of a system considers the computer's response so superior to his own senses that the human reading is ignored, the user is in trouble (and probably poorly trained). Mr. Collins' remarks about soldiers accepting a faulty fire-control system reading over what can clearly be seen applies to every financial analyst who has not performed a "reasonableness test" on an analysis.

I hope that the U.S. Department of Defense continues to develop and test new high-tech weapons systems. The ones that do not work can be identified in peacetime at a lot lower cost in dollars and lives than during a war. If at some future time my friends or my son have to face an enemy, I want them to have the most advanced high-tech weapons available, not just a tried and true low-tech bayonet.

Ernest J. Denzer Jr.
Delano, Minn.

Watch it

"From fancy to fact" [CW, Aug. 14] prompted me to think of the other scenarios that we all may go through when "the computers may become a basic part of one's attire, as essential and unextraordinary as a wristwatch."

We all know the pleasure and pains of running our life according to watches. Is wearing a watch an ordinary event? I think we have given away our liberty and freedom to the second hand that slowly creeps forward to remind us of our next office meeting, the appointment with the dentist or the bills we have to pay.

If the wristwatches have invaded our freedom and liberty, imagine what the wrist computer can do to our life. We will be in constant touch with our office. Imagine all the work we will be forced to accomplish when we wait in the airport to catch a plane! Imagine streets full of people walking around staring intensely at their wrists to know the latest Dow Jones average or the latest baseball score! Just as we sneak to look at somebody else's watch to see the time, others will start to sneak a peek at other's wrist computers.

We may certainly have all the good things this new technology can offer. At the same time, however, we should look at other problems and opportunities this new technology may bring us.

Chetan S. Sankar
Management Department
Auburn University
Auburn, Ala.

Turnover time

Regarding "The call of greener pastures" [CW, July 31], so what if there are greener pastures elsewhere? In the IS field it's been a seller's market in most places for more years than I can remember. Employers keep turnover down to reasonable levels by managing for retention. This requires putting as much emphasis on the "keeping" side of the staffing equation as on the "getting" side.

There are two key elements to this strategy. First, employers have to review the entire employment life cycle — from the wording of ads to career planning — to identify where they are making themselves vulnerable to turnover. Second, and most important, they must hold line managers at least partially accountable for turnover.

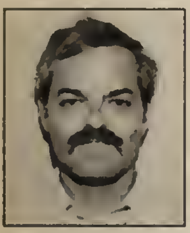
I want managers to pass the 3 a.m. test — if you woke them at that hour and asked them what their bosses measure them on, turnover should be on the list. We're past the stage where human resources can take full responsibility for finding — and keeping — good people.

Gil E. Gordon
Gil Gordon Associates
Monmouth Junction, N.J.

Computerworld *welcomes comments from its readers. Letters may be edited for brevity and clarity and should be addressed to Bill Laberis, Editor,* Computerworld, *P.O. Box 9171, 375 Cochituate Road, Framingham, Mass. 01701.*

Get ready for the 486 future

JEFF ANGUS



If you are an IS specialist or PC manager, you are about to be inundated by a tidal wave of ill-considered punditry on the performance of the 486-based microcomputers due out before the end of the year. Like most tidal waves, this one is all wet.

Departments that use micros, ever-searching for better performance (or more prestigious digital paperweights), are going to hammer you with requests for these systems and then be horribly disappointed.

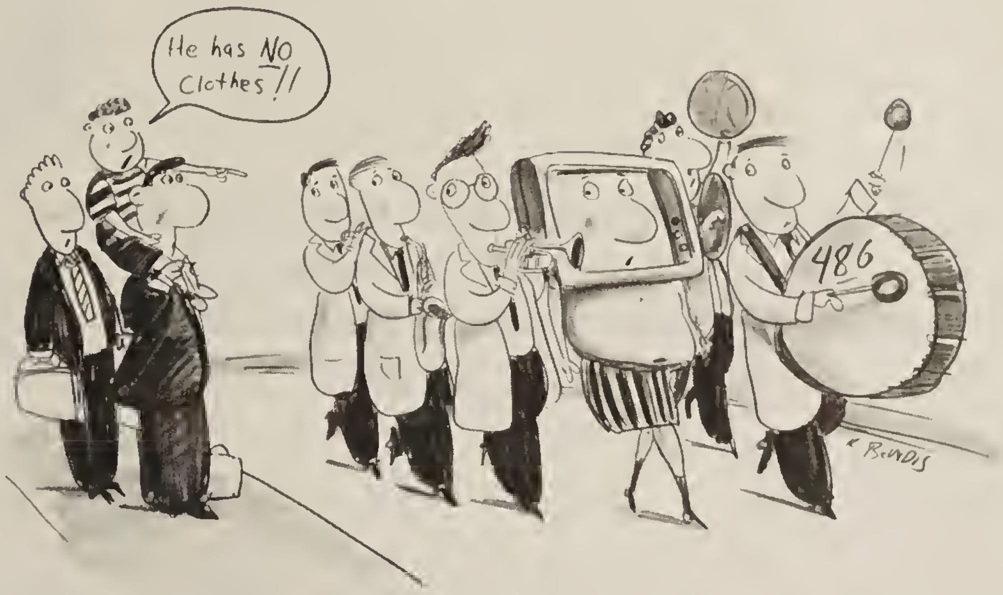
Intel claims 80486 performance advantages of 100% to 300% over its 386 CPU. Such types of tests as whetstones and MIPS measures, which overly specialized lab wizards run, bear that claim out. Technology managers, however, should remain skeptical. Users running popular contemporary applications will find that the 486 newcomers will out-perform the fastest machines from the 386 family by only about 20%.

The blush of unjustified, uncritical love will fade to disappointment as the starry-eyed early users who wailed for the systems discover that they can use a 486-based machine and not wake up the next day with Stephen Hawking's brains and Mel Gibson's looks. The problem is that the clear benefits of 486 technology are not tied together by the programs that today's power users live and die by. Whether it is an SQL front end, a CAD program or even the largest 1-2-3 application you've ever seen, the 486-powered systems are not, in most cases, going to increase productivity any more than the less expensive high-end 386s.

What *are* the key benefits of 486 technology? One may be better integration of other units, such as the math coprocessor, into the CPU. The 486 requires fewer instructions to execute data from its cache and fewer system clock cycles to execute an instruction.

But what may be the key addition in the 486 is intrinsic support for multiprocessor computing. The 486 lends itself to a level and style of computing that none of the lab wizards are likely to find. What they are looking at are things the 486 systems can astound with. But the tests measure simple speed, and this is really more speed than users need. The 486 is certainly not the leap over the 386 that the 386 was over the 286. And most importantly, does it provide a boost for people's business goals?

IBM's release of 486 upgrade hardware did not slow the 1989 wave of IBM-bashing. While the hardware didn't revolutionize computing, it did exactly what it was intended to do: make an IBM PS/2 one of the speediest systems around. It fails to be magic because the weak component of Model 70 speed was not the processor but the disk and disk I/O systems. So, IBM bypassed its largest opportunity for speed improvement.



Paying 50% more for a machine that performs a spreadsheet recalc in three minutes instead of five is meaningless. Either way, it puts the end user in coffee-break land. And if the task is smaller, say 30 seconds on the current system, the 486 should do it in 20. You have to save a lot of 10-second increments to justify $3,500 more. In the spreadsheet case, managers gain a lot more productivity by leaving the employee on a high-end 386 or 286 and investing in training in spreadsheet design. The hours that users save using good design and coding techniques can blow away the minutes saved by 486 processing.

Does that mean the 486 hardware is not worth your consideration? Nope. For graphics-intensive processing and file-server situations in which the current system is bogging down and preventing a job from getting done, it's a rational decision today. But virtually no spreadsheet or database work justifies a 486.

The *full* effect of what a 486-based system can do is still hidden, waiting for the programs and applications that harness all that engineering genius for a revolutionary gain. At that point, it will be sensible to sign big purchase orders for big 486 system orders.

What the bozos in the lab-coat ghettos aren't constitutionally prepared to understand is that some new technologies aren't produced to provide *quantitative* advances but aim to provide a *qualitative* change.

The 486 chip's most important contribution isn't along "the same but more of it" route; it is a different approach to processing.

Good managers already know that sometimes it is all wet to confuse speed with performance.

Angus is a manager at Farallon Computing, Inc., a manufacturer of Macintosh networking hardware and software in Berkeley, Calif.

Can Apple get a slice of the service support pie?

AMY D. WOHL

Experienced technology users have learned — usually, the hard way — that good products are only as good as the support that comes with them.

Recently, users and IS staff of big companies have been out shopping for better support. As IBM's National Service Division says, "Customers don't like to deal with piece parts;" especially when the parts come from more and more vendors and the applications are increasingly complex and sophisticated. As big systems vendors find themselves selling smaller and more powerful systems, they look to selling services as a significant and growing part of their business.

DEC has announced new and enhanced programs for systems integration to support and maintain heterogeneous computing environments and even to provide training and troubleshooting for corporate users of popular PC software packages.

In addition, IBM has not only consummated the fascinating Kodak deal (in which IBM is actually taking over Kodak's IS function), but it is also talking to dozens of customers about providing similar arrangements. IBM will happily design, install and support systems that include both IBM and non-IBM hardware and software.

A vice-president of the National Service Division indicated that IBM may consider supporting an entirely non-IBM system, particularly if it was potentially tied to substantial future IBM business.

So what does this all mean for a vendor such as Apple? Apple is struggling with the problem of large-scale corporate support. There is no trouble getting excellent support for Macintosh computers from the regular Apple dealer channel. The difficulty is that Macs have now grown beyond isolated PCs or small, homogeneous Macintosh networks, largely selected for specific niche applications such as graphics design and desktop publishing. They are becoming a significant part of some very large corporate networks. And only a few Apple dealers feel comfortable discussing — or connecting to — IMS databases or complex SNA networks.

At the same time, John Sculley knows that part of Apple's spectacular growth is fueled by its lean-and-mean ratio of revenue dollars per employee. In fact, all those old-style computer companies that have been laying off employees in the last few months mightily envy Apple's ability to leverage its partners into providing expensive services at little cost to Apple's own balance sheet. So Sculley is visibly reluctant to give up this advantage — and anger his partners — by staffing up to directly provide the kind of support IBM and DEC have been promoting.

Easy for some

To be fair, it's a lot easier for traditional systems vendors such as IBM and DEC to provide this kind of service. They have enormous investments in physical facilities, in-place management and skilled employees, all of which need profit-producing work. Being successful in the systems design and implementation business and providing support — even for your competitors' systems — can keep a lot of expensive head count busy and produce a lot of revenue.

Apple may like the dollars this potential support business offers, but it lacks the in-place investment in bricks and mortar and the right quantity of in-house big-systems skills. Of course, Apple could choose to build an appropriately-sized support organization, but this would take time, cost money and be at odds with Apple's strong commitment to the channel.

Apple has worked on improving its support alternatives. There is the small Apple Integrated Systems group, which has begun to take on systems integration of Macs and other vendors' products as a business. Apple expects this group to grow but is interested in keeping it small and using partners such as systems integrators. Apple has already had some success with such a plan in its federal systems business.

Of course, Apple remains concerned with channel bump. It needs continued good relations with its dealers and is loathe to compete with them. And there are other ways. Take what IBM recently did. In March, it announced an Entry Systems Service Amendment for service partnership. This permits IBM dealers to provide IBM support where necessary and to choose how to pair it with their own support. The customer pays the dealer, the dealer pays IBM when it needs help, and everyone goes home happy.

Apple's field organization now provides advice and support from operational locations throughout the U.S., especially to its directly handled, large customers. This group may be permitted to grow and has the advantage of being locally managed and more responsive.

The questions remain: If customers want not just support but accountability and one-stop shopping, how does Apple maintain its growth rate into the large accounts? Some combination of growth in the areas above, plus increased use of partners such as DEC — which includes Macs in the non-DEC systems that it will be pleased to integrate together — may do the trick.

I suspect, however, that big shops looking for a lot of attention and a lot of skilled support will continue to put pressure on Apple and other PC vendors to move up into the systems business.

It's a tough choice, but words of guidance are available: The customer is always right. And right now, as they take on the really sophisticated, big-payback applications, customers want more support.

Wohl is president of Wohl Associates in Bala Cynwyd, Pa., and editor of "The Wohl Report on End-User Computing" newsletter.

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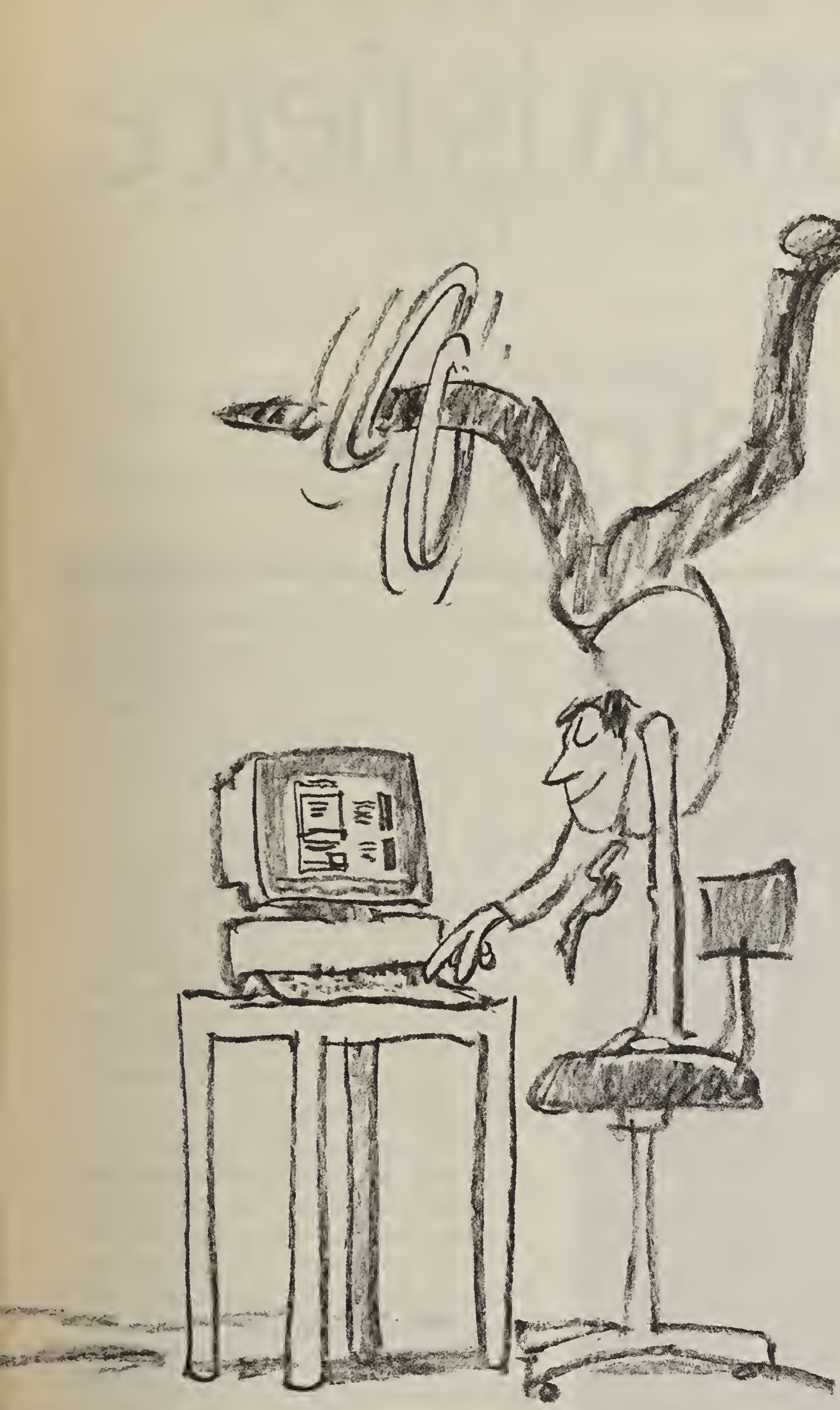

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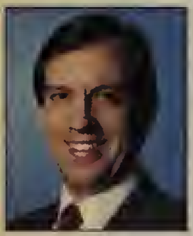


Sometime in the next century, there will be a movement to revive handcrafted software.

This will come as a rebellion against the dehumanizing mass production engendered by computer-aided software engineering once it takes over. Given the rate of acceptance of CASE, that could be a while yet. But the day will come.

Why is this bound to happen? Nostalgia and status-seeking, two of the most powerful elements in human behavior, will always triumph over practicality.

The nostalgia for handcrafting is strong and will reassert itself, as it always has. We have seen this in so many fields; why not in software? For example, hand-carved, gilded signs have largely replaced the machine-

Continued on page 30

Inside

- New York schools get automated. Page 25.
- Intel's I860 chip loses its shine. Page 25.
- CA rolls out tools for PCs, LANs and mainframes. Page 26.

AFCOM says 'lights on' for now

Managers balance automation with search for quality, job redefinition

ANALYSIS

BY AMY CORTESE
CW STAFF

KANSAS CITY, Mo. — Two years ago, the promise of "lights-out" data center operations had information systems executives conjuring up images of darkened, self-supporting data centers humming away without human intervention. Those initial expectations have been tempered by time, as evidenced by the more realistic expectations of operations managers at the recent Association for Computer Operations Management (AFCOM) conference on automated operations.

While few of the 325 attendees believe that unattended operations are attainable in the foreseeable future, most have plans under way to automate operations to unprecedented degrees (see story page 65). "We're not talking lights out or unattended; we're talking automated," said Robert Taylor, manager of computer processing with Northrop Corp.'s aircraft division.

Similarly, Kris Duflo, an operations manager at Spartan Stores, Inc. in Grand Rapids, Mich., said, "Lights out is not realistic for most." More likely, he said, data centers may run certain shifts unattended — for instance, weekend or night shifts — and mostly rely on human staff to supervise routine operations that have been automated.

The driving force behind automation is to increase the quality of service as well as reduce staff requirements and associated costs, according to attendees. Often, automation is seen as a step necessitated by hard times.

"The ones that move the fastest [to automate] are the ones in trouble," said Gary Purviance, an operations manager with Kaiser Aluminum in Spokane, Wash. Kaiser, which has undergone two changes of ownership in the past couple of years, has had to cut back on staffing. As part of the consolidations, a data center in Oakland, Calif., with a staff of 70 people was closed, leaving the Spokane data center to handle the extra work.

Purviance ties the shop's ability to handle the work of two data centers to hard work from remaining employees and software that has automated many functions. For instance, report distribution has been automated, with all printed output produced in four-hour "dark" printing periods each day. Purviance said his shop is also looking to redesign the system to provide more on-line output and begin automating console operations.

In other cases, the decision to automate results from a careful study weighing the benefits against costs. John Cunningham, deputy division chief of the operations division at the Defense General Supply Center in Richmond, Va., said his operations are about a quarter of the way to a goal of 80% to 90% automation by 1992. "It's an expensive business decision, but we look at it as increasing service to the customer. You can't translate that into dollars," he said.

Cunningham said that after visiting state-of-the-art data centers, such as that of Electronic Data Systems Corp. in Dallas, an automated operations team identified seven categories of software needed to automate the supply center's operations, including scheduling and report and problem management.

Like most attendees talking about automating, Cunningham stressed that he did not expect to lose any staff but rather intended to redefine jobs. "In most cases, they end up with better jobs," he said. Currently, a training officer is examining the issue to identify new positions.

The attendees hailed primarily from large IBM shops, where — not surprisingly — most of the automation product activity is. Robert Orre, systems control resource supervisor for Johnson Wax, a division of S.C. Johnson & Son, Inc. in Racine, Wis., observed that the products for unattended operations exist,

Continued on page 32

Controller update ready

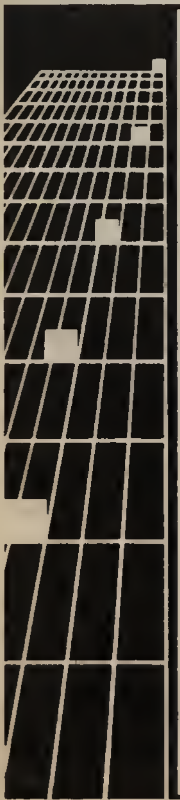
BY ROSEMARY HAMILTON
CW STAFF

By the first quarter of 1990, IBM users will finally have complete 3990 Model 3 controllers available to them as the long-awaited extended functions become available.

This latest schedule, which IBM quietly announced earlier this month, comes more than a year after its original shipment date for its most advanced controller. IBM said that the direct-access storage device (DASD) Fast Write extended function will be available in December and that it would follow that with the Dual Copy feature in the first quarter of 1990.

In early 1988, IBM announced that it would not meet its target shipment date of the 1988 third quarter for its 3990 Model 3. In September that year, it announced that it would ship the unit without the extended functions by December. At that point, IBM said the extended functions would be available under an Early Customer Support Program in the first half of this year but did not release an official availability date.

The controllers, which have been shipping since December 1988, are fully functional units. However, the extended functions help users get more performance out of them. The DASD Fast Write feature increases the performance by as much as three times as compared with a noncache controller. The Dual Copy function increases data availability by automatically creating two copies of information and storing it in the subsystem.



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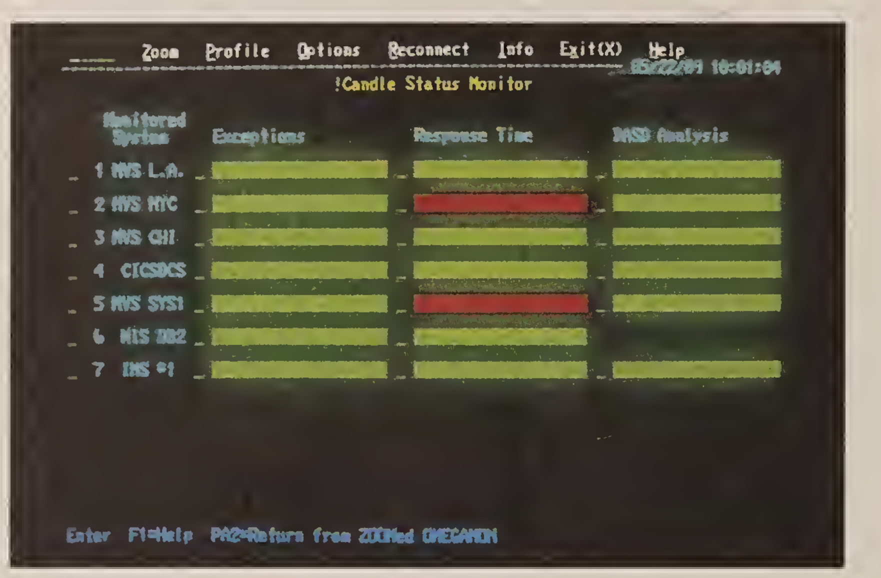

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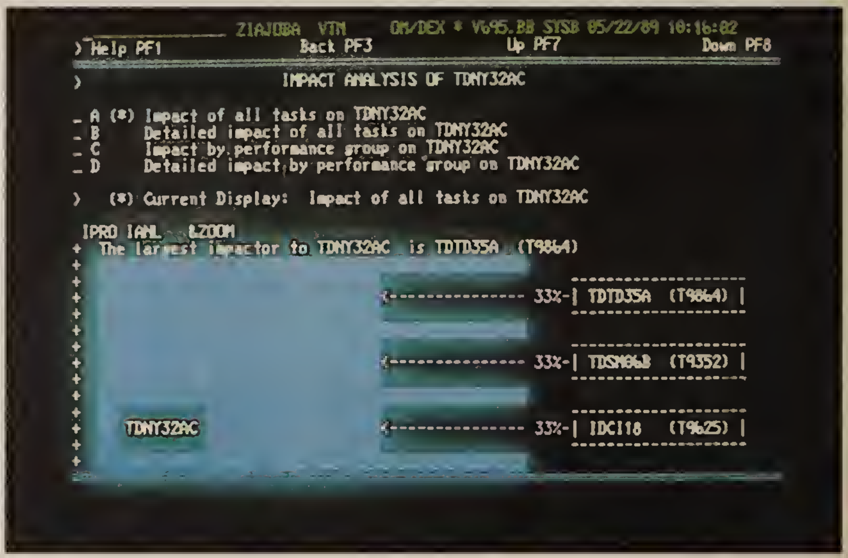

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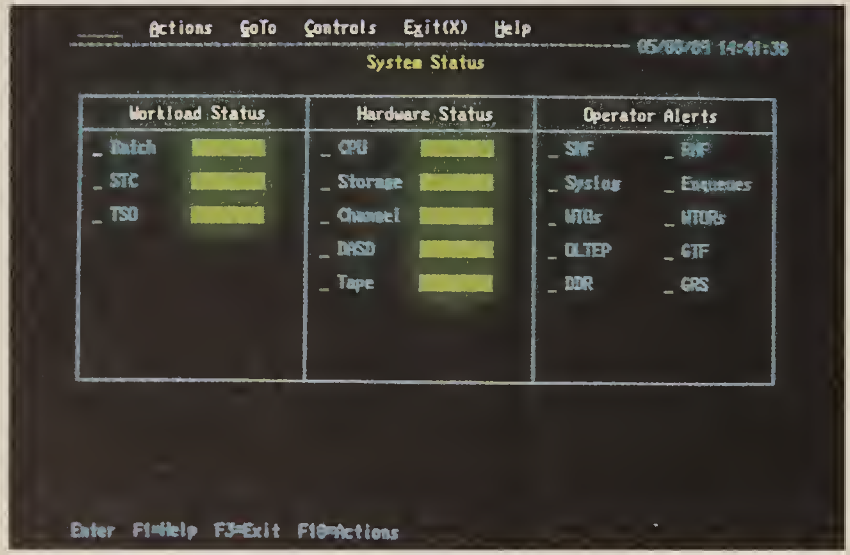

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 | _ TSO           | _ Channel       | _ WTOs    _ WTORs   |
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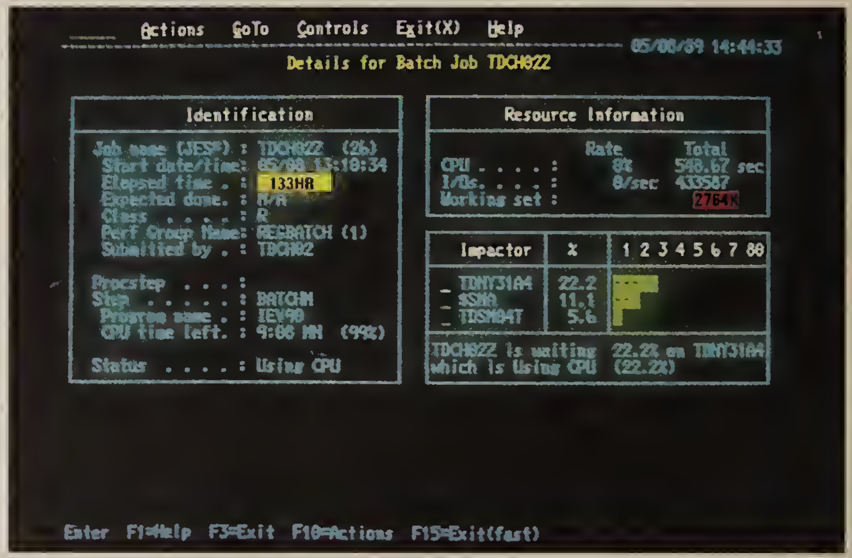

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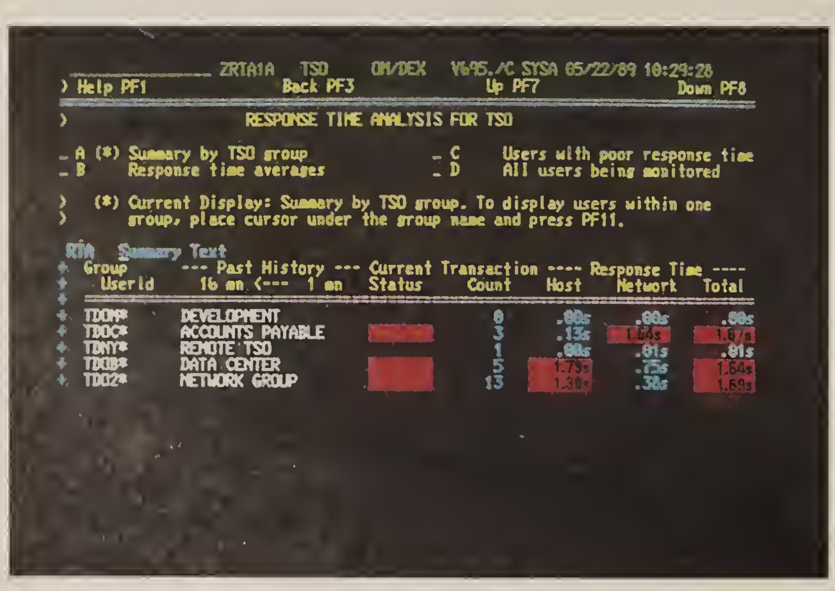
 |  Start date/time: 05/08 13:10:34 |  | CPU . . . . :   0%   548.67 sec|
 |  Elapsed time . : 133HR          |  | I/Os. . . . : 0/sec  433587    |
 |  Expected done. : N/A            |  | Working set :          2764K   |
 |  Class  . . . . : R              |
 |  Perf Group Name: REGBATCH (1)   |  | Impactor  |  %   | 1 2 3 4 5 6 7 80 |
 |  Submitted by . : TDCH02         |  | _ TDNY31A4| 22.2 |                  |
 |                                  |  | _ $SNA    | 11.1 |                  |
 | Procstep . . . :                 |  | _ TDSM04T |  5.6 |                  |
 | Step . . . . . : BATCHN          |  | TDCH022 is waiting  22.2% on TDNY31A4|
 |  Program name . : IEV90          |  | which is Using CPU  (22.2%)          |
 |  CPU time left. : 9:00 MN  (99%) |
 | Status  . . . . : Using CPU      |

Enter  F1=Help  F3=Exit  F10=Actions  F15=Exit(fast)
```

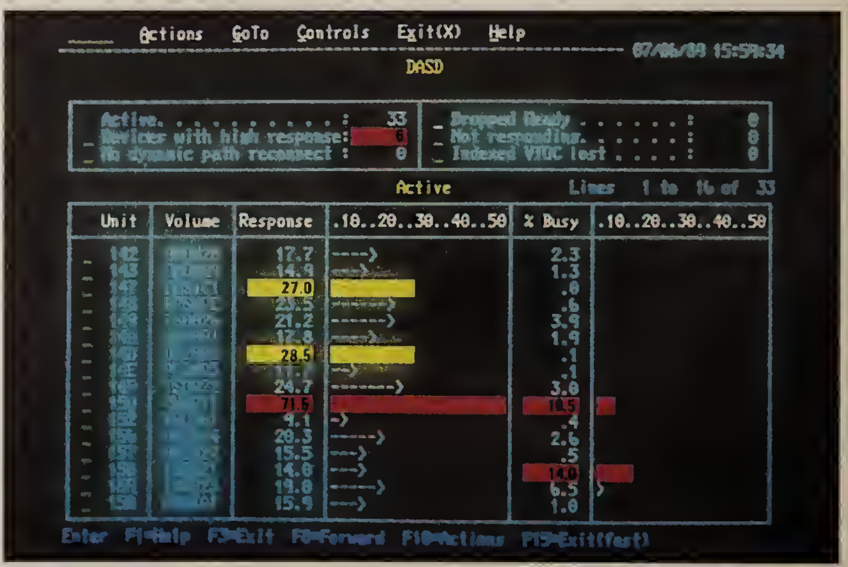


```
_______________ ZRTA1A   TSO    OM/DEX   V695./C SYSA 05/22/89 10:29:28
) Help PF1              Back PF3             Up PF7              Down PF8
)                    RESPONSE TIME ANALYSIS FOR TSO

_ A (*) Summary by TSO group              _ C     Users with poor response time
_ B     Response time averages            _ D     All users being monitored

)  (*) Current Display: Summary by TSO group. To display users within one
)      group, place cursor under the group name and press PF11.

 RTA  Summary Text
+ Group        --- Past History --- Current Transaction ---- Response Time ----
+   UserId       16 mn <---   1 mn  Status      Count      Host    Network   Total
+
+ TDOM*       DEVELOPMENT                         0         .00s      .00s     .00s
+ TDOC*       ACCOUNTS PAYABLE                    3         .13s     1.54s    1.67s
+ TDNY*       REMOTE TSO                          1         .00s      .01s     .01s
+ TDOB*       DATA CENTER                         5        1.79s      .75s    1.54s
+ TD02*       NETWORK GROUP                      13        1.30s      .38s    1.69s
```



```
____  Actions  GoTo  Controls  Exit(X)  Help
                                         07/06/89 15:59:34
                          DASD

 |   Active. . . . . . . . . . . :   33 | _ Dropped Ready . . . . . . :  0 |
 | _ Devices with high response:      6 | _ Not responding. . . . . . :  0 |
 | _ No dynamic path reconnect :      0 | _ Indexed VTOC lost . . . . :  0 |

                          Active              Lines   1 to  16 of  33
 | Unit | Volume | Response | .10..20..30..40..50 | % Busy | .10..20..30..40..50 |
 |      |        |   17.7   | ---->               |  2.3   |                     |
 |      |        |   14.9   | --->                |  1.3   |                     |
 |      |        |   27.0   |                     |   .0   |                     |
 |      |        |   23.5   | ------->            |   .6   |                     |
 |      |        |   21.2   | ------->            |  3.9   |                     |
 |      |        |   17.8   | ----->              |  1.9   |                     |
 |      |        |   28.5   |                     |   .1   |                     |
 |      |        |          | -->                 |   .1   |                     |
 |      |        |   24.7   | -------->           |  3.0   |                     |
 |      |        |   71.6   |                     |  10.5  |                     |
 |      |        |    4.1   | ->                  |   .4   |                     |
 |      |        |   20.3   | ------>             |  2.6   |                     |
 |      |        |   15.5   | ---->               |   .5   |                     |
 |      |        |   14.0   | ---->               |  14.0  |                     |
 |      |        |   19.8   | ------->            |  6.5   | >                   |
 |      |        |   15.9   | ---->               |  1.0   |                     |
Enter  F1=Help  F3=Exit  F8=Forward  F10=Actions  F15=Exit(fast)
```

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High-flown I860 claims brought down to earth

BY JAMES DALY
CW STAFF

Six months after its much-ballyhooed release, the shine has begun to tarnish on Intel Corp.'s reduced instruction set computing (RISC) I860 chip.

The rub involves a growing feeling among industry observers that architectural deficiencies may hamper Intel's original claim that the 64-bit chip can adequately serve as a stand-alone microprocessor.

"It's a shame Intel chose to stain what was a very solid technological achievement with overblown claims," said Andrew Allison, editor of "RISC Management," an industry newsletter. "Those trying to use it as a stand-alone CPU might find that very tough to do. For all practical purposes, its applications will come as a coprocessor."

The chip was designed for technical computing in engineering and scientific applications where high integer performance, high floating-point performance and substantial three-dimensional graphics capabilities are needed.

A major area of concern is that central processors require a number of software capabilities that the I860 does not have, said Sanjiv Hingorani, an analyst at Salomon Brothers, Inc. research firm in New York. Other analysts said the I860's ease of programming lags far behind other RISC microprocessors offered by such vendors as Sun Microsystems, Inc. and Mips Computer Systems, Inc.

A report prepared recently by Electronic Trend Publications in Saratoga, Calif., criticizes the chip's cache. "In a large multiuser environment, the internal caches of the I860 will result in relatively high miss rates," the report read. Additionally, "a large amount of work needs to take place for creating a proper Unix environment."

Some potential customers said the I860 will be used as a coprocessor by default, because it differs from earlier Intel chips. "It has the capability to stand on its own, but I think most vendors would rather use it to juice up what they're already sure of," said Ed Sund, a member of the personal computer support team at Weyerhaeuser Information Systems in Tacoma, Wash.

Despite the debate, the need for greater computational punch has some vendors lining up to use the I860, which delivers up to 10 million floating-point operations per second and contains more than a million transistors.

Among the converts

Among the converted is IBM, which is working with Intel to develop a bus master card using the chip, and Ing. C. Olivetti & Co., which said it will incorporate the I860 along its entire product line. Microsoft Corp. President Bill Gates has also given the chip favorable lip service.

Dozens of other vendors are also quietly giving the chip the once-over, including Hewlett-Packard Co. "The I860 offers us a lot of interesting possibilities," said spokesman Bill Bennett, citing the role of a coprocessor as one example.

A 33-MHz version of the I860 is expected to ship in production quantities by the end of the year, as will samples of a 40-MHz version. Machines based on the chip are not expected until next year.

PCs keep tabs on N.Y. students

Record-keeping system eases placement, frees teachers from paperwork

ON SITE

BY RICHARD PASTORE
CW STAFF

NEW YORK — You walk into the pandemonium of the first day of school. As a transfer student, you don't know anyone, and they don't know you. It will take six to eight weeks for your records to arrive from your old school. In the meantime, officials place you in class levels based on a five-minute phone conversation or, even worse, a best guess.

This bad dream was reality for New York public school pupils in past years. This September, however, school officials were able to type transfer students' names into a personal computer. In seconds, the system pulled the records from a citywide database so that students could be accurately placed before the first-period bell.

This improvement was made possible by the Automate the Schools project (ATS), an $88 million record-keeping and tracking program now enrolled in 72 of New York's 924 public schools.

When fully implemented in an estimated 2½ years, the ATS program — designed around a networked system of IBM Personal System/2s, 9370s and a 4381 — will be used by some 155,000 teachers and administrators to keep tabs on more than one million students. In addition to its citywide search function, the system is designed to free teachers and administrators from the shackles of paperwork.

"There has been a tremendous amount of paperwork reduction for the teachers, which lets them spend more time with the students," said Howard Sapossnek, a recently retired principal of a junior high school in the first district to be automated.

For example, before automation began nearly a year ago, teachers took attendance manually in a roll book, from which class lists were tediously compiled, Sapossnek said. Now, teachers make marks on a standard attendance card, which is scanned into the system via an on-site optical-mark reader. The new method cuts the process time from 45 minutes to three minutes, Sapossnek said.

Menchini *heads automation project*

An alphabetical student directory requested twice a month by a state welfare agency "was not even done at some schools because of the amount of work it required," Sapossnek added. Now, it is another function of the ATS program.

Board of Education employees and outside consultants poured 900 man-days into the software development effort, which began in January 1988. Completion of the first version was hurried for a September 1988 implementation in the first school district.

The software runs in distributed mode on the 4381, located at a central data center in Brooklyn, and on five 9370s located in the city's five boroughs. The 9370s are linked to the individual school's PS/2s.

The developers wrote the software with the Model 204 database management system and development tool from Computer Corporation of America (CCA). Program director Gino Menchini said he chose the CCA product because it bested IBM's DB2 and Cullinet Software, Inc.'s IDMS in a benchmark test of the application run on the 9370.

The 4381 and 9370s are linked together and to the PS/2s by a T1 backbone wide-area network over leased lines. An IBM Token-Ring network links the PS/2s within each school.

Despite its innate benefits, the system's designers knew they had to make it elementary to use for those benefits to be realized. "A lot of the users are secretaries who often have no past exposure to PC functions," Menchini said. In view of this, the system's interface is menu-based and incorporates touch-sensitive screens.

If the system passes its citywide test, Menchini said, the state of New York may promote it for use on a statewide level.

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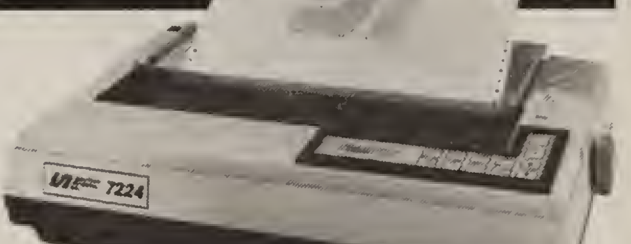


CA stacks up product enhancements

BY ROBERT MORAN
CW STAFF

Although Computer Associates International, Inc. was busy addressing high-profile concerns about the fate of recently acquired Cullinet Software, Inc.'s IDMS database two weeks ago, it also announced a series of products and enhancements that shored up its offerings of applications development software on the mainframe, the personal computer and local-area networks.

The following products, which are as yet unpriced, will arrive in beta testing in the fourth quarter of this year and throughout 1990, the company said.

CA-DB:Cbase is an applications development package for mainframe relational development systems that is compatible with the Dbase language from Ashton-Tate Corp.

The product will use the C programming language, which will permit portability across multiple hardware platforms, the company said.

Furthermore, the nonprocedural prototyping system — which includes panel, Help and error message facilities — will allow organizations to "take advantage of the large talent pool of programmers knowledgeable in Dbase," according to CA Chairman Charles Wang.

CA-Ideal Release 2.1 is an application development system that supports the SQL option to CA-Datacom/DB 8.0 and extends data management support to VSAM.

With the new release, users will reportedly be able to embed SQL directly within CA-Ideal procedures or allow the products' data manipulation language to generate the appropriate SQL requests for them.

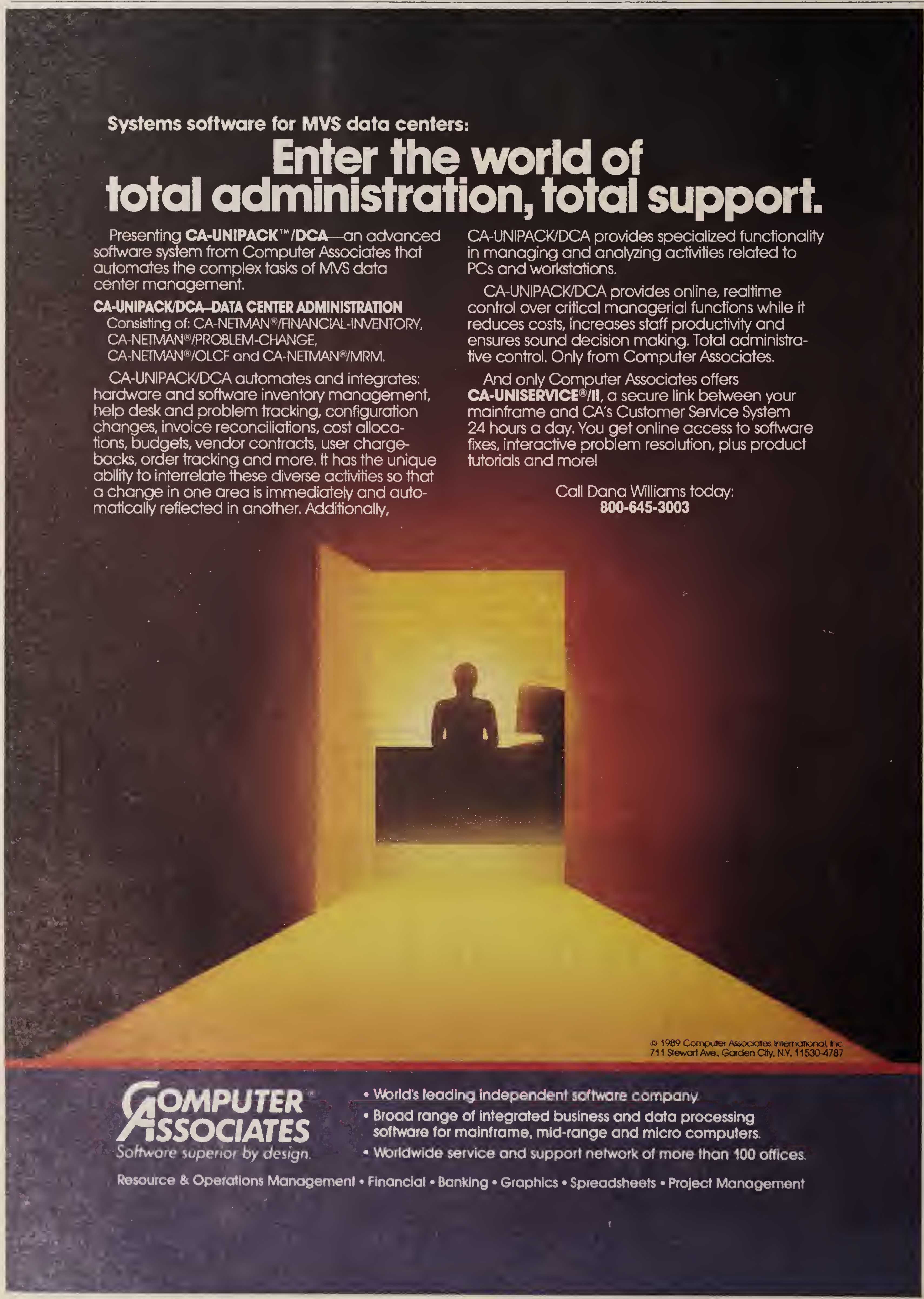
The release also supports closer integration with IBM's DB2. For example, IBM's DB2 will be able to call a CA-Ideal exit to determine the appropriate application plan name at the beginning of each logical unit of work. A CA-Ideal procedure definition language statement will permit the plan name to be modified.

The closer integration, according to the company, will allow the product to take better advantage of DB2's ability to associate application plans with CICS transactions.

CA-Ideal/PC is a PC-based workstation for the development and execution of CA-Ideal applications; it includes a nonprocedural panel and report definition facilities. Organizations will be able to develop and execute applications on the economical PCs and run programs on the mainframe without modification, the company said. The initial PC-DOS release will be followed by a release that will support OS/2.

CA-DB/PC is a relational database for PC-DOS and OS/2, which the company said will provide full compatibility with CA-Datacom/DB, including SQL support. In addition, the product will contain precompilers for embedded SQL in Cobol as well as C, and it will initially be released for DOS, followed by a version for OS/2.

CA-DB:Server will support database server configurations of CA-DB/PC in LANs. CA-DB:Star/PC reportedly allows integration with CA-DB:Star, a distributed database manager that permits distribution of CA-Datacom/DB between the mainframe and PCs.



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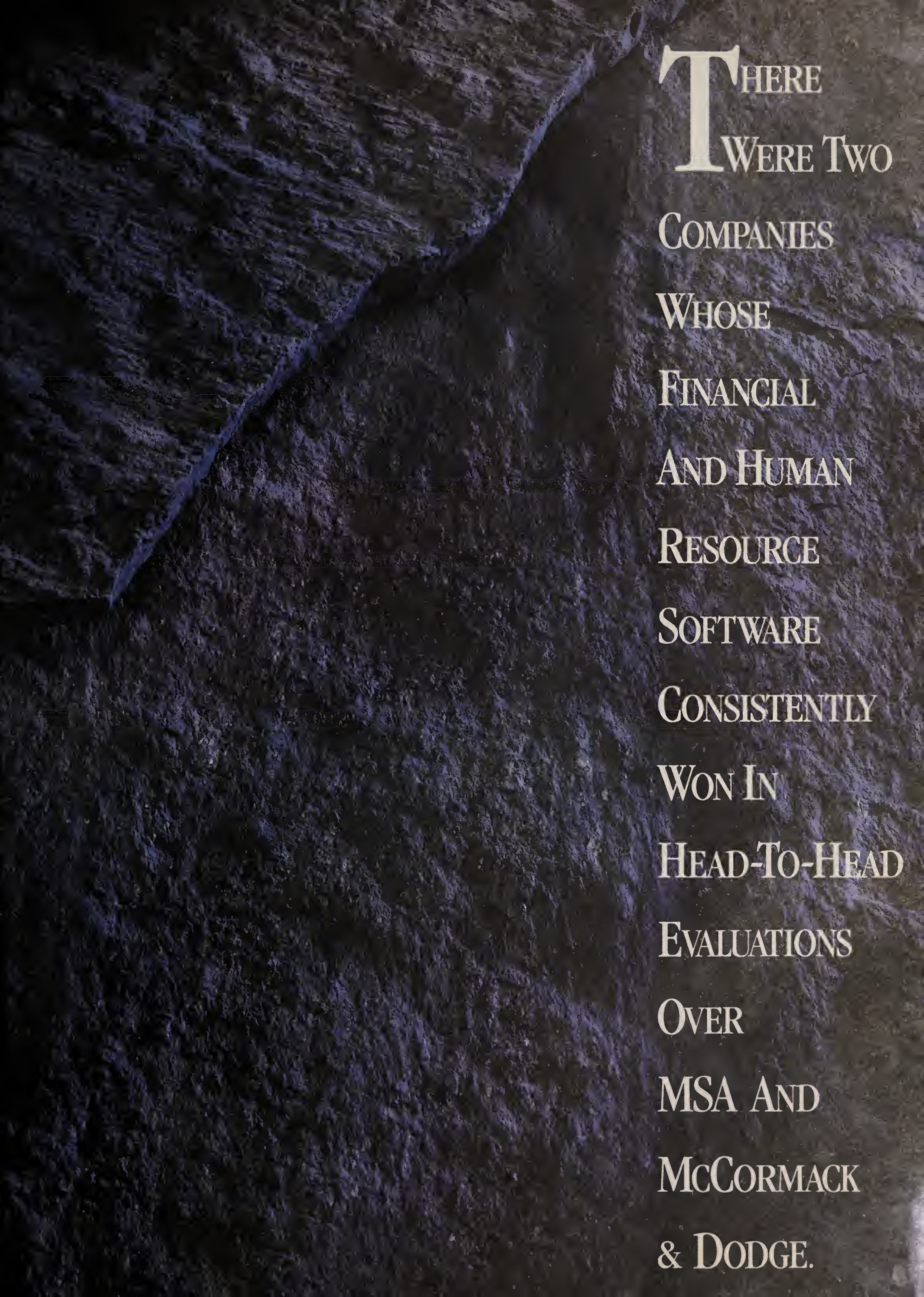

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HARD BITS

Unisys goes for Filenet imaging

Unisys Corp. selected **Filenet Corp.** to provide it with imaging software for the Unisys hardware platform. Unisys did not specify when it would begin marketing the system. Filenet is planning to port its Image Access Facility software to the Unisys hardware over the course of the next year. A Unisys spokesman said that the project is expected to involve both high-end systems and personal computers.

Storage Technology Corp. signed a deal with **Bull H. N. Information Systems, Inc.** to provide its 4400 Automated Cartridge Systems (ACS) for use with Bull's high-end mainframes. Bull will provide the necessary enhancements to use the ACS on a special-quote basis, and Storage Tek will provide the ACS directly to Bull customers.

Sequoia Systems, Inc. said it has standardized on the small computer system interface technology for its mass-storage interface. The intent of this move is to give Sequoia access to a host of peripherals on the market for use with its fault-tolerant systems.

Gibson

FROM PAGE 23

made neon of the 1950s in many areas.

Similarly, an executive with a handwritten, custom-programmed executive information system (EIS) is bound to claim a cachet his peers cannot match. He will lord it over other decision makers who use cookie-cutter EIS systems, churned out en masse on the cheap by some CASE tool.

Not only will handcrafted software become the executive yuppie rage, but software engineers, who will pretentiously don the label "software craftsmen," will look down their noses at any but the most laboriously created codings. Anyone who can't appreciate their work will be looked down on as someone who just doesn't know.

There are likely to be colonies of craftsmen springing up, creating precious handcrafted software products. They will found software crafts colonies in picturesque seaside towns, opening shops for tourists.

There will be theme parks: "Rte 128 of the 20th Century." And "The Old 101 Trail," in Silicon Valley. They will have recreations of 20th-century office buildings with programmers clad in period attire: blue jeans and golf shirts for development managers; T-shirts, beards and ponytails for hard-core programmers. They will pore over workstations, turning out programs that will be put on sale in the parks' gift shops.

Tourists of the future will seek out the parks in their RVs, desiring to go back to a quieter, slower time. The tourists will be heard telling their children: "Look, Billy, that's how your great-grandfather used to earn his living, writing software by hand." The child, barely paying attention, will breathe a sigh of relief that he won't have to live out his days like that.

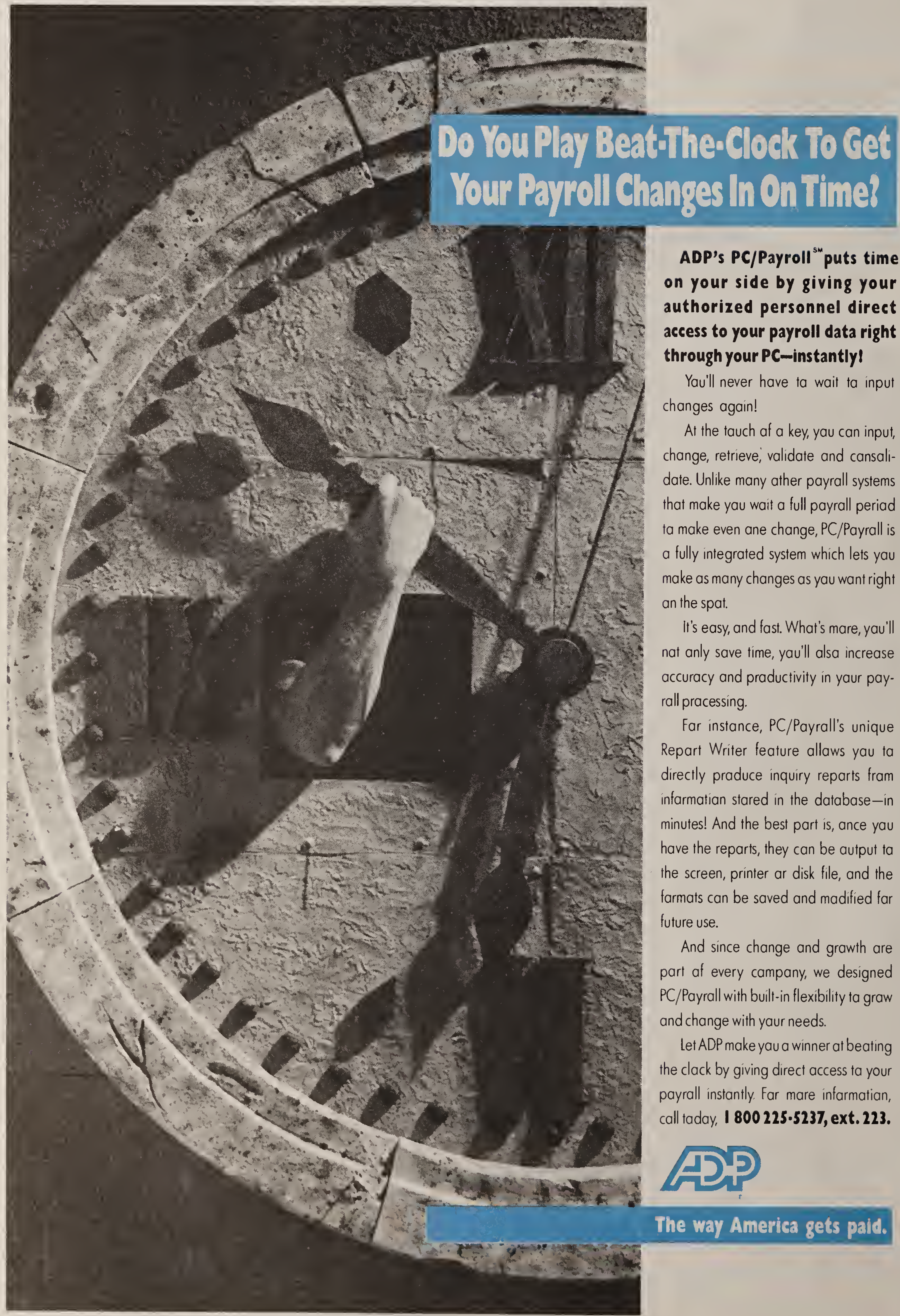
In community centers around the country, there will spring up crafts classes in the evening for adults wishing to broaden themselves by writing their own software.

Just as the art of calligraphy continues to be popular among hobbyists, despite the fact that the printed word is one of the most ubiquitous and least expensive commodities in the world today, so coding in Cobol is bound to catch on again.

Advertisements will appeal to possible students: "Learn Cobol, the forgotten art. Impress friends and feel the satisfaction of writing something yourself."

So, don't get carried away by the promise of CASE. Enjoy the spiritual satisfaction of writing in Cobol while you can.

Gibson is *Computerworld's* senior editor, software.



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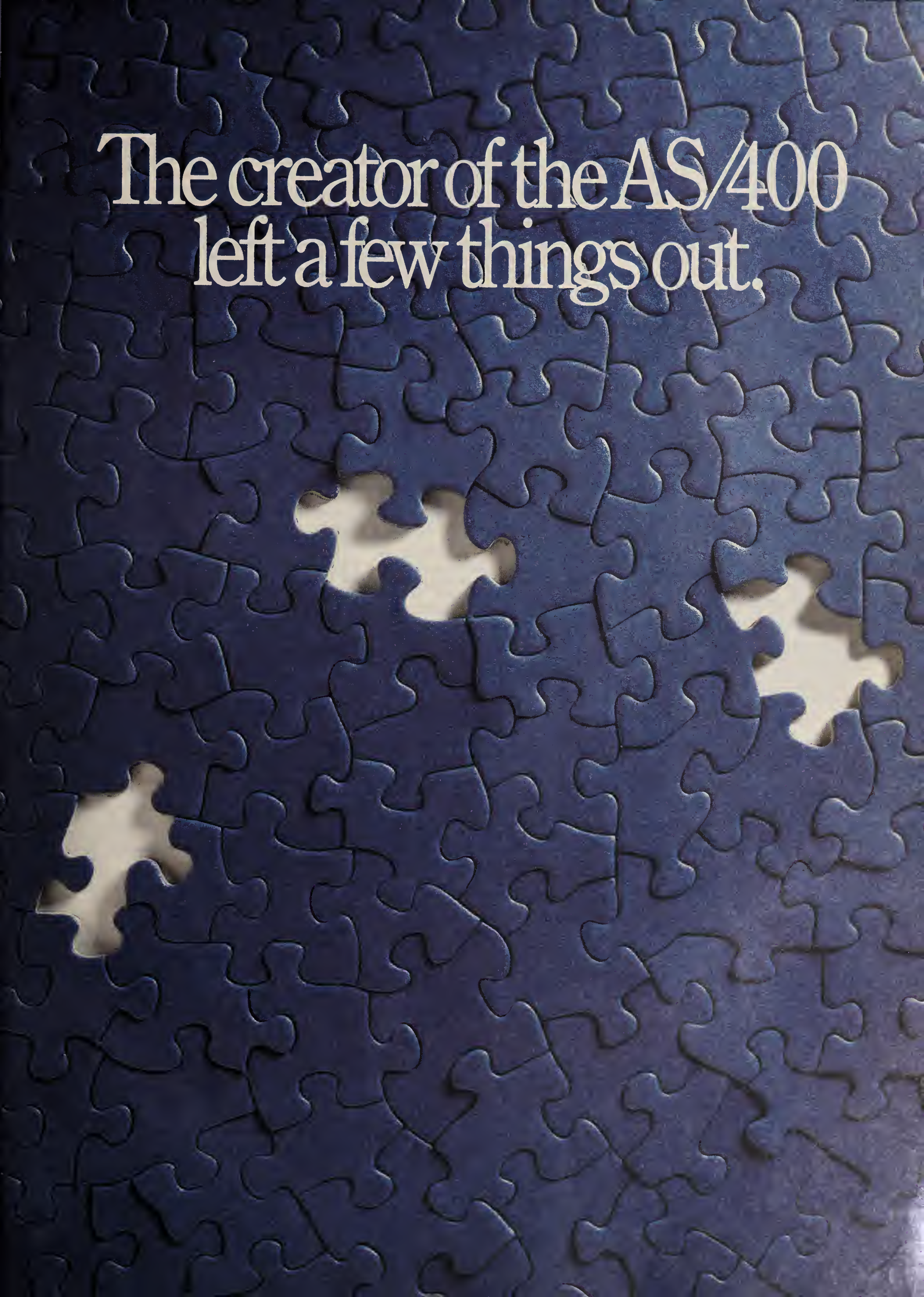
The creator of the AS/400
left a few things out.

NEW PRODUCTS — SYSTEMS

Power supplies

Electronic Specialists, Inc. has expanded its Isolator family of AC line protectors to include models for computer-aided design and manufacturing systems.

The units reportedly include 39K surge amp suppressors and provide wideband, high-attenuation filtering for system isolation and protection.

Available in commercial, industrial and laboratory grades, the protectors are said to prevent power line interaction between the workstation and the computer or peripherals. Options include power fail interrupt, remote power switching and 20-amp models.

Pricing starts at $100.

Electronic Specialists
171 S. Main St.
Natick, Mass. 01760
508-655-1532

ISO-1, *an Isolator line protector*

Taesung Industries, Inc. has added a 500-watt model to its line of uninterruptible power supplies (UPS).

Called Model UPS-5150H, the UPS has a total output of 500 watts and shares the 3- by 11- by 17-in. cabinet of the company's 300-watt Model 3150, the vendor said. The unit reportedly provides power fluctuation security for small to medium file servers, Intel Corp. 80386-based personal computers with high-resolution monitors and multiuser servers with attached terminals. Modular battery extension units are available.

The UPS sells for $549.

Taesung Industries
Suite 240
2001 Westside Pkwy.
Alpharetta, Ga. 30201
404-664-8944

Exide Electronics has extended its family of Powerware Uninterruptible Power Systems with the addition of the Powerware System 50 and the Powerware System 150.

The System 50 reportedly meets power requirements of 20 to 50 kVA for midrange systems such as the IBM 9370 and DEC VAX 8600. Pricing for the system starts at $28,600.

The System 150 can handle loads that range from 100 to 150 kVA IBM mainframes and DEC 8800 Vaxcluster environments, the company said.

The product is priced from $61,200.

Exide Electronics
3201 Spring Forest Road
Raleigh, N.C. 27604
919-872-3020

Processors

Point 4 Data Corp. has announced the Mark 386/25, a 25-MHz, multiuser system based on the Intel Corp. 80386 microprocessor.

The product reportedly runs under The Santa Cruz Operation's Xenix System V.2.3 operating system and is offered in desktop and tower configurations. It supports up to 64 users, provides up to 24M bytes of random-access memory and is targeted at entry-level or midrange multiuser computing environments. Pricing starts at $7,400.

Point 4
15442 Del Amo Ave.
Tustin, Calif. 92680
714-259-0777

Mercury Computer Systems, Inc. has announced the release of the MC6400VS, a 12 million instructions per second, 25 million floating-point operations per second attached processor designed for a single slot in the Sun Microsystems, Inc. Sun-3 and Sun-4 workstations.

The double-precision processor reportedly offers as much as 64M bytes of on-board memory and runs at an 80-ns clock speed. The product includes C and Fortran compilers.

Package pricing begins at $25,000 for a 16M-byte system, and versions are also available for the Motorola, Inc. VMEbus.

Mercury Computer Systems
600 Suffolk St.
Lowell, Mass. 01854
508-458-3100

Data storage

Nemonix, Inc. has unveiled the NX860-CTU, a cache and translation buffer upgrade for the Digital Equipment Corp. VAX 8650 that expands cache memory from 16K to 64K bytes and stretches the translation buffer from 512 to 2,048 entries. The product is reportedly a two-board set, exchanged for the DEC L0204 and L0205 VAX 8600 processor boards.

Backed by a lifetime warranty, the upgrade costs $45,000.

Nemonix
106 South St.
Hopkinton, Mass. 01748
508-435-9087

Clearpoint Research Corp. has announced memory upgrades for the Digital Equipment Corp. Vaxstation 3100 systems.

The DCME-31 series is reportedly available in 8M-, 12M-, and 16M-byte stackable array cards. The cards allow users to configure Model 30 and 40 systems to a total of 16M, 20M, 24M or 32M bytes. According to the company, the cards connect to the CPU board using DEC's factory-installed connectors and are customer-installable.

Prices are $5,400, $7,200 and $9,600 for the DCME-M31/8MB, DCME-M31/12MB and DCME-M31/16MB, respectively. The three models are supported by a lifetime warranty and a 24-hour replacement policy.

Clearpoint Research
35 Parkwood Drive
Hopkinton, Mass. 01748
508-435-2000

Trimarchi, Inc. has announced a tape system that reportedly connects directly to an Ethernet network and provides 12G bytes of unattended, redundant backup.

Ethertape, a member of the company's Etherstor family, reportedly supports Digital Equipment Corp.'s LAVC software and provides multivolume, scheduled programmable backup with electronic mail logging notification.

The price is listed at $7,000 per 2G-byte tape-transport unit.

Trimarchi
P.O. Box 560
State College, Pa. 16804
814-234-5659

I/O devices

Talaris Systems, Inc. has announced the 1590-LN Printstation, a 15 page/min. multiuser printer system.

The product is reportedly based on the Ricoh Corp. 4150 engine, features emulation of Digital Equipment Corp.'s LN03 Plus and has an optional direct Ethernet interface. The unit is said to have two 250-sheet paper trays that are software-selectable as well as legal-size paper support.

With 17 resident fonts and an RS-232/MMJ serial interface, the system costs $6,490. The optional Ethernet interface costs $1,690 for the standard version and $1,950 for the thin-wire model.

Talaris Systems
6059 Cornerstone Court W.
P.O. Box 261580
San Diego, Calif. 92126
619-587-0787

North Atlantic Industries, Inc. has introduced the Laser IID-T, a Tempest Hewlett-Packard Co.-compatible laser printer that provides two-sided printing and functions with HP-compatible software, font cartridges and soft fonts.

According to the company, optional Sharespool Cards and cables are available to permit access to a printer by up to four terminals as far as 100 ft. away. An optional envelope feed is also said to be available, permitting sequential printing of pages and envelopes.

The printer costs $7,995.

North Atlantic Industries
60 Plant Ave.
Hauppauge, N.Y. 11788
516-582-6500

Carroll Touch, Inc. has introduced an industrialized touch-active 512- by 256-pixel flat-panel electroluminescent display.

The hermetically sealed display unit reportedly was designed for harsh environments. The product is said to feature a low-profile touch frame that measures approximately ¼-in. thick.

The 11- by 7- by 3-in. unit includes eight-level brightness control, an audio enunciator and a single RS-232 interface, according to the company.

The price is listed at $3,895, and quantity discounts are available.

Carroll Touch
P.O. Box 1309
Round Rock, Texas 78680
512-244-3500

Concurrent releases faster Cobol compiler

BY SALLY CUSACK
CW STAFF

TINTON FALLS, N.J. — A Cobol development environment created for real-time transaction processing markets, including securities and trading systems, banking, insurance, health care and other industries, has been released by Concurrent Computer Corp.

Code software runs under a proprietary OS/32 operating system and was designed to produce highly optimized code for the vendor's Series 3200 hardware platform. According to the company, applications developed with Code perform on an average of three to four times faster than those developed with Concurrent's previous Cobol compiler offering.

Targeted for commercial programmers, the software provides an interpreter for developing, prototyping and testing and a compiler for program execution. Programs are developed by compiling to and debugging intermediate code rather than machine code, which reduces development time and allows for a quicker editing, compiling and debugging cycle, according to the company.

The Code product set includes a Cobol compiler and interpreter, a symbolic debugger, a forms package, a performance profiler, utilities and additional tools.

Pricing for the software ranges from $6,250 to $24,760, depending on the processor class. Another version has also been made available for the IBM Personal Computer and compatible machines. Code/PC is priced at $2,995. Both products are currently shipping.

AFCOM

FROM PAGE 23

but only for certain environments, most commonly IBM's MVS. However, for the increasing number of multivendor sites, this is a problem. Johnson Wax has a mixed environment, which includes systems from Tandem Computers, Inc., Stratus Computer, Inc., Digital Equipment Corp. and IBM. Each system has its own console, but Orre would like to consolidate control.

Similarly, Pete Dean, at Sandia National Laboratories in Livermore, Calif., which makes use of DEC VAXs and Cray Research, Inc. supercomputers, was among the handful of attendees looking for automation software for non-IBM environments.

When asked what attracted her to automated data center operations, Janet Siew, a computer operations analyst from Singapore Airlines, said, "There is an awareness that you have to [move] towards this." The objective is "not so much cutting costs, but to eliminate errors" stemming from conditions such as mental fatigue that often accompany night shifts, Siew explained.

Despite toned-down expectations, some users do think unattended operations are achievable. Joseph DiBlasi, director of administrative services at Boston University, said that by 1990, the university will have no console operators. BU's operations staff has shrunk from 31 in 1987 to 11 today. Plans call for only seven employees in January 1990, who will be redeployed during the following year into other areas or lost through attrition.

DiBlasi stressed that no employees would be adversely affected and that the driving force for automating is quality: "Anyone who looks at it from purely a cost savings is missing the point."

Once again, it took IDEA to complete the picture.

Ask IBM about the connectivity capabilities of the AS/400 and they'll say they've got all the pieces put together.

Sure, they've integrated PC Support into the host system, but upon closer inspection, you'll see there are a few details that Big Blue has overlooked.

Diminished host performance.

With PC and PS/2 users connected to the AS/400 via PC Support, you may discover you'll require a larger CPU or a second one just to handle your basic computing needs.

Running PC Support on the AS/400 consumes a lot of expensive host resources – at least 300-500K of host memory per user. And that's probably enough to bog down the host and make it unable to process data at the pace your organization needs it.

PC memory loss.

By accessing the AS/400 via PC Support or a Token Ring connection, your PC doesn't have enough memory left to concurrently run the PC applications it was designed for. The combined functions of PC Support take up more than the 640K memory allotted by DOS. Which means you'll be loading and unloading PC software applications to stay within DOS.

Eventually, a PS/2 running OS/2 may solve this memory consumption problem, but can you afford to replace all your existing workstations?

Feature limitations.

To make matters worse, PC Support restricts your terminal and printer emulation options. It doesn't offer Model 3180 emulation, so you can't work in 132 column documents. There's no Model 4214 printer emulation. And you'll find PC Support is pre-configured for IBM PC printers only. Configuring your third-party equipment will cost you time, money and aggravation.

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PCs & WORKSTATIONS

MICRO BITS

Michael Alexander

Very important dates

A few weeks ago, I was thumbing through a manuscript of a book on personal computer viruses and other kinds of electronic vandalism. I noticed there were several viruses timed to attack on key dates.

There was the Datacrime or Columbus Day (Oct. 12), the Friday the 13th (Oct. 13), the Cascade (any time in October) and the Traceback (Dec. 5 through Dec. 28, depending on the strain).

Some computer security experts have also told me there are several strains of the Jerusalem virus on the loose that are poised to reach a critical mass of sorts before the end of the year. As I understand it, it takes about two years before a virus spreads far and wide enough to pose a serious problem. In that time, the virus is picked up by hackers, modified and sent out under other monikers (the Hebrew University, Israeli Brain and South African viruses are all apparently variations of the Jerusalem virus).

Continued on page 41

SQL Server shines in OLTP test

Microsoft outdoes larger rivals, points out downsizing benefits

BY PATRICIA KEEFE
CW STAFF

REDMOND, Wash. — If you cannot benchmark your SQL server against competitors in the same class, why not play David to a minicomputer- or mainframe-based Goliath? With downsizing all the rage, that is exactly what Microsoft Corp. has done, applying some spit and polish to a somewhat dormant database benchmark along the way to outshining its lumbering test-mates.

Together with co-developer Ashton-Tate Corp., Microsoft recently released an independently audited benchmark report detailing how the partners' SQL Server topped the performance of larger rivals in tests said to measure the power of on-line transaction processing (OLTP) systems.

Although competitor Gupta Technologies, Inc. has shipped the only other microcomputer-based SQL server available today, it was not included because its product's performance is too slow, claimed Dave Kaplan, Microsoft's SQL Server product manager.

Of importance from a downsizing perspective, Microsoft claimed that SQL Server's price/performance — measured in dollars of system cost per transaction/sec. — was four to 15 times lower than comparable mini and mainframe figures. This shows that local-area networks hold promise as cost-effective platforms for OLTP, Kaplan said.

The report was audited by independent database analysts Richard Finkelstein of Performance Computing and Colin J. White Consulting, publisher of *Infodb* and *Database Review.* Based on the de facto industry standard TP1 benchmark, the results demonstrate that the personal computer is capable of supporting high-performance OLTP, publisher Colin White and Finkelstein said in a joint statement.

"Microsoft conducted these benchmarks in a completely open manner," White explained, adding that the tests were run under "very realistic" conditions using commercially available software.

The TP1 benchmark dates back almost 20 years and measures database performance on mainframes and minis by simulating a series of banking transactions in a controlled environment. Microsoft adapted the minicomputer version of TP1 to run OS/2 and MS-DOS systems in a client/server environment. The renamed TCP-A test was further fine-tuned to the LAN environment. The benchmark

Continued on page 41

Lotus kit saves time, coding; users see limits

BY RICHARD PASTORE
CW STAFF

CAMBRIDGE, Mass. — After promising more than two years ago to deliver a 1-2-3 tool kit that gives Release 3.0 add-in developers a leg up, Lotus Development Corp. came through this month. Beta-test users claimed that the kit can slash add-in development time by one-third and cut total coding lines by 60%. But it is not designed to meet every challenge, they warned.

The Lotus Add-In Toolkit for Release 3 — formerly code-named Leaf — consists of a Pascal-like programming language, a 1-2-3 function library for accessing 3.0 features and an editor, debugger and compiler.

The $395 package is aimed at sophisticated end users and corporate developers in addition to commercial add-in developers, Lotus said. With it, they can build custom "@" functions, which are shorthand commands for performing specific tasks, thereby tailoring the program for specific applications.

After writing an add-in in C language for Release 2.2 and writing the same add-in in the tool-kit language for Release 3.0, commercial developer Dan Fylstra said the 3.0 version took one-third less development time and 60% less code lines than did the 2.2 version. "It was much, much easier to write with the tool kit," said Fylstra, president of Frontline Systems, Inc. based in Palo Alto, Calif.

The relative ease stems from the fact that the tool kit performs an intermediate compilation that converts the developer's instructions into specific 1-2-3 commands, said Robert Ainsbury, coordinator of information management at Conoco, Inc. in Houston.

However, both Ainsbury and Fylstra said the kit is not as effective or even appropriate in some cases. "It has no language facilities to handle graphics," Fylstra said. "It doesn't do everything that commercial developers will ever need. But it probably does almost everything a corporate developer would need."

"Ninety-five percent of the applications that people want to develop will be far, far easier," Ainsbury agreed. "But if you wanted to write an add-in like Allways or one that really deals with the heart of the 1-2-3 engine, there isn't the extensibility

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Inside

- Wendy's has expert systems on the menu. Page 39.
- Audiophiles get digital audio tape recorders. Page 39.
- Lack of OS/2 interest quells some Presentation Manager shipments. Page 41.

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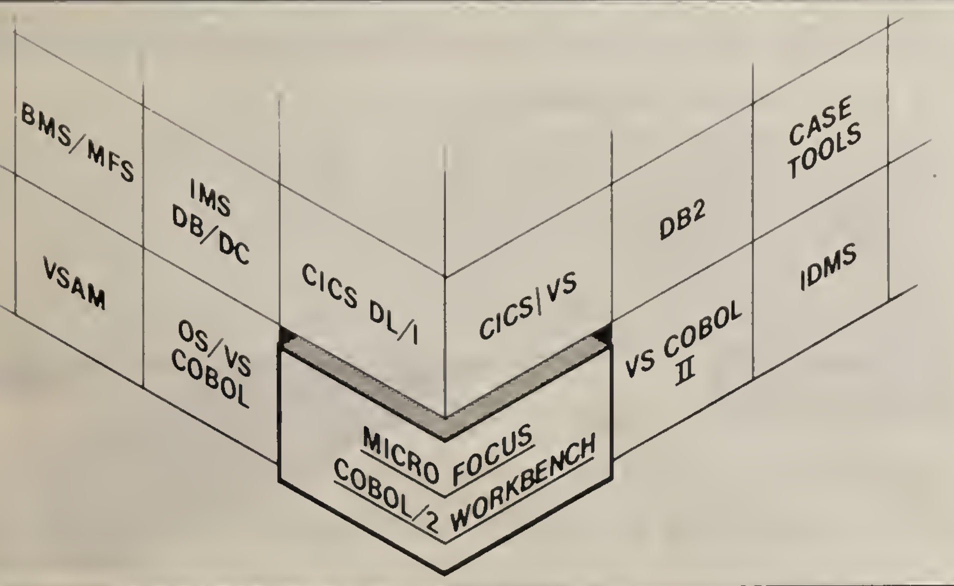

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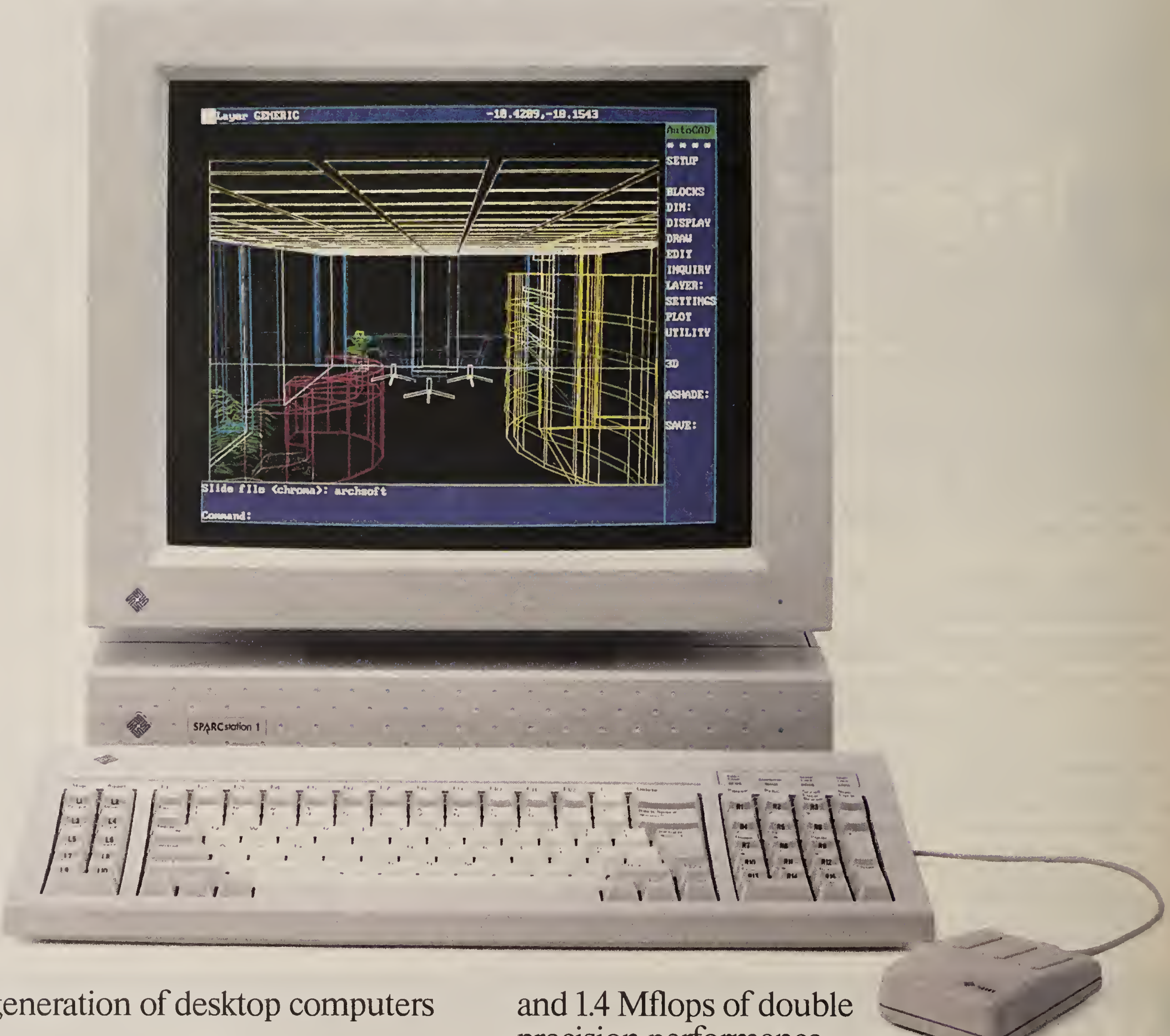

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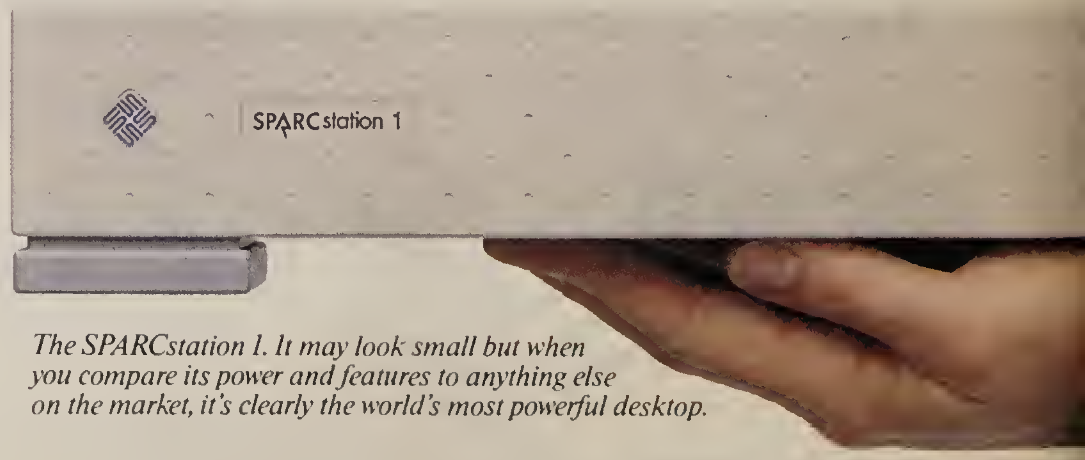

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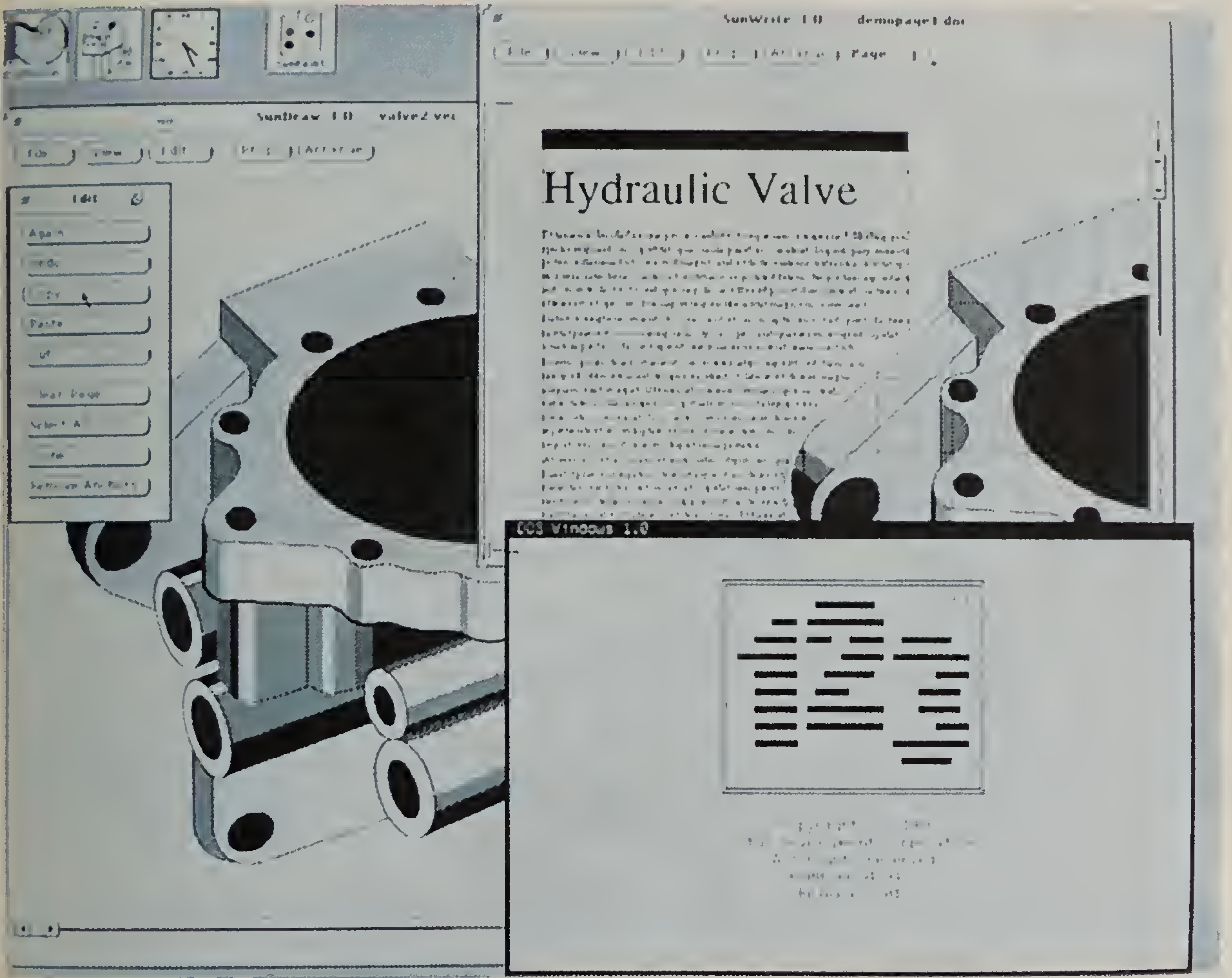

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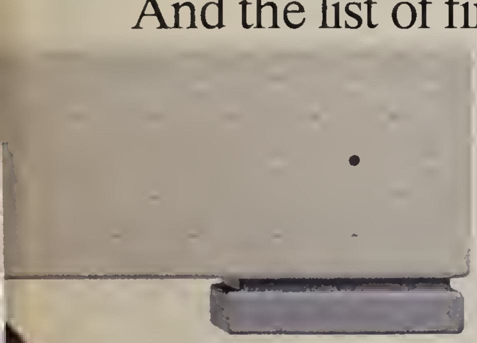

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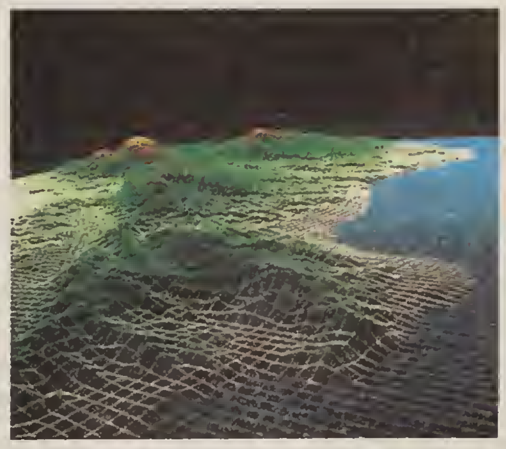

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The color of NEC laptops

BY MICHAEL ALEXANDER
CW STAFF

WOOD DALE, Ill. — With the debut of the Pro Speed CSX portable computer next month, NEC Home Electronics (U.S.A.), Inc. will be the first firm to ship a laptop with a color LCD, according to a NEC marketing representative.

"It's a niche product," said Michael Pritchett, product manager of laptop computers for NEC's Computer Products Division. "Initially, we expect that it will appeal to such users as the medical profession, where color is important in medical diagnostic software."

The new portable sports a color LCD with an 8.3- by 5.2-in. viewing area and supports IBM's Enhanced Graphics Adapter and Color Graphics Adapter video modes in color and Video Graphics Array (VGA) mode for text.

In addition, the Pro Speed CSX uses an Intel Corp. 16-MHz 80386 SX microprocessor and comes equipped with 2M bytes of random-access memory, which is expandable to 4M bytes with a memory card, a 1.44M-byte, 3½-in. floppy disk drive and either a 42M- or 100M-byte hard disk drive.

The laptop weighs 18½ pounds, including a built-in AC adapter, and measures 15 by 14.4 by 4 in.

NEC said that it will begin shipping the new unit in mid-October at a suggested retail price of $8,499 with the 42M-byte hard disk drive. It will cost $9,499 with the 100M-byte hard disk drive.

Wendy's system finds the beefs

Troubleshooting service reps now fix mechanical glitches in record time

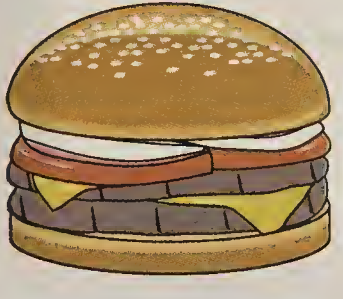
ON SITE

BY JAMES DALY
CW STAFF

DUBLIN, Ohio — The next time you order a cheeseburger at your local Wendy's restaurant and that little slice of cheddar is not completely melted, fear not. Help is on the way.

While the fast-food industry has gulped down high-tech faster than a teenager goes through an order of fries, the foibles of managing sophisticated ordering and cooking equipment have sometimes made the job of getting a sizzling burger from the grill to your mouth a nightmare for the support staff.

That scenario is changing at Wendy's International, Inc. In May, the company installed an elaborate expert system that makes the task of fixing a fry-o-lator or repairing a point-of-sale terminal a veritable snap.



Until recently, if equipment was on the blink, the store manager would call Wendy's Field Operations Support Center (FOSC) and explain the problem to a service representative. The troubleshooter would then have to rely on his own expert system — the human brain — to solve the problem, often leaning on two or three months worth of training, thick user manuals and a smattering of personal experience to iron out wrinkles.

Trouble was, there were holes in the method. Sometimes, it was difficult for a store manager to precisely describe what was wrong, or a manual had not been updated. The idea of installing the first expert system came about "to have a single reference source for all diagnostic activities," said Bruce Stabile, Wendy's director of information systems.

Today, Wendy's has installed 1st-Class Fusion by 1st-Class Expert Systems, Inc. in Wayland, Mass. Service representatives now man an IBM Personal System/2 Model 30 that walks them through the problem solution cycle, dropping down through a series of pertinent questions and providing answers at each level. The system also allows the dozen FOSC staffers to display graphical representations of each piece of equipment, allowing for more precise explanations.

"With a typical problem — say, trouble with a wireless headset — the system will often lead the rep from problem to solution in a matter of minutes," Stabile said. He added that anyone at Wendy's 1,100 company-owned stores can access service 24 hours a day, seven days a week.

Stabile has nothing but praise for the new setup. "Our productivity has increased, as has the consistency in solving problems," he said.

Agreement positions DAT for market move

BY MICHAEL ALEXANDER
CW STAFF

COSTA MESA, Calif. — A recent agreement between record companies and makers of digital audio tape (DAT) recorders could not have come at a better time for end users of DAT backup storage systems, according to Kenneth Campbell, vice-president and general manager of the DAT product division at Archive Corp.

After several years of acrimonious debate over copyright protection, the record industry and makers of DAT recorders recently signed a pact that will finally permit American music lovers to buy DAT recorders.

If sales of DAT recorders, which are slated to begin here early next year, take off as expected, manufacturers will be able to ramp up production for both music and tape backup machines. The economies of scale will make the price of DAT backup systems even more attractive to corporate customers, Campbell said.

Archive has been quietly showing off its new Python DAT drive in a half-height internal and an external version. The company said last week that it will be among the first to introduce "computer grade" DAT backup systems for personal computers, workstations and other computer systems. While the DAT recording mechanism and tape used in data storage are identical to those used to record music, Archive's units have been engineered specifically for computer storage, Campbell said. They are more reliable and smaller than consumer DAT recorders and are engineered to better cope with excessive tape tension variations, uncontrolled stops from high speeds and other characteristics of DAT transport mechanisms, he added.

A single DAT, only 4mm wide in a cassette about the size of two matchboxes placed side-to-side, is capable of storing up to 1.3G bytes of data using helical-scan recording techniques — the same technology used in videotape recorders.

The tape sells for $10 but could cost as little as $5 in only three years, Campbell said. Improvements in design and longer tape lengths will make it possible to eke out as much as 4G bytes of storage on a tape in only a few years, he added.

The company also plans to market a cartridge loader capable of automatically handling up to five tapes, which contain 6G bytes of storage capacity.

The nascent DAT market will also be driven by several other factors beyond the prospect of becoming a low-cost storage alternative. "Customers are asking for greater storage capacity at a lower cost, smaller form factors, reliability and unattended backup," Campbell said. The Python, with its half-height form factor and optional loader, meets those needs, he said.

Archive has not announced a price for the drives and loader, although they will probably be priced at approximately $3,000 and $1,000, respectively, Campbell said. The company plans to introduce the drives in October and begin shipping evaluation copies in December.

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Alexander

FROM PAGE 39

In any event, I wrote a short article about the approach of the "virus season" and then followed it up with a slightly longer one last week about a few remedies under consideration by some companies.

Other publications in both the trade and consumer press have picked up on the idea of a "virus season."

As a result, I have been inundated with calls from readers who are alarmed that a wave of viruses will sweep through the installed base of PCs on certain days and shut down PCs across the land.

They have reason to worry — not only for the impending virus season that I first described, but also because viruses are rapidly becoming a day-in, day-out, all-year-long problem.

I have spoken to computer security experts who have been able to isolate the Datacrime virus, for example. I'm told that it appears that the virus was concocted last March 1; since then, four strains have been identified. One of the strains is set to go off Oct. 12; another is set to go off Oct. 12 or any day after.

Winn Schwartau, president of American Computer Security Industries, Inc. in Nashville, speculated that the virus may have been devised by an experienced programmer, perhaps in West Germany, and then distributed at the Galactic Hackers Conference in Amsterdam this summer. From there, it has no doubt already traveled all over the globe.

"The Datacrime virus is extraordinarily destructive and very powerful," Schwartau told me. It attacks .COM files on a hard disk, and the only way to remove it — without an antiviral antidote — is to do a low-level format of the disk (while removing all of the disk's files at the same time).

This particular virus is difficult for casual computer users to identify, Schwartau said, because it will not attack any .COM file that has the letter D as its seventh letter.

In other words, the virus has been designed to attack all but the COMMAND.COM file that is invariably in the root directory of a hard disk. That file is often the target of various sorts of viruses; antidotes that are designed to identify and fix problems caused by most viruses are based on that premise, too. Antidotes will look at the COMMAND.COM file to see if its size has changed but not neccesarily look at other .COM files on the disk.

Attacking every .COM file but COMMAND.COM is a sneaky tactic and quite effective. It is the only virus that I know of that is aimed at circumventing detection or repair by antiviral software.

It bears mentioning that there are several procedures that can be followed to protect your computer systems against computer terrorism of this sort, whether it comes in October or at any other time. Make sure that end users understand and follow procedures for safeguarding their PCs. For example, they should be barred from loading any programs onto their machines that have not been given a thorough check first. This especially applies to shareware. Vaccines, which ward off certain strains, and antidotes, which fix problems that viruses cause, can also be useful. The highest level of protection will include hardware and software that meet the federal government's data encryption standards.

I would be wary of any company that claims to have an elixir that will fix all ailments caused by viruses, however. There is no single remedy, because with each new day comes a new virus.

Alexander is a *Computerworld* senior editor, PCs and workstations.

Mark your calendar

The trigger dates for a variety of viruses are fast approaching, according to Eugene Spafford, a Purdue University computer scientist, and two of his colleagues. The three experts are working on a book aimed at helping end users cope with viruses and other sorts of electronic vandalism. John McAfee, president of the Computer Industry Virus Association, added that his group also believes the virus season is upon us.

Trigger dates for selected viruses are as follows:

• **August 1989 onwards — Fu Manchu.** Substitutes characters.
• **Oct. 12 — Datacrime.** Delivers a message and corrupts hard-disk format.
• **Oct. 13 — South African.** Deletes files. **Israeli or Jerusalem.** Deletes files. **Friday the 13th.** Deletes files.
■ **October through December — Cascade.** Displays cascade.
■ **Dec. 5 onwards — Traceback.** File infection.
■ **Dec. 28 onwards** — Another strain of **Traceback.** Displays cascade.

Lotus

FROM PAGE 39

in the language now to do that."

A further complaint is that not only is the kit limited to Release 3.0 development, but it does not facilitate the conversion of add-ins written in C or assembly language from earlier 1-2-3 releases.

Lotus product manager Chris Smith acknowledged these limitations. Although no time frame was specified, he said the company plans to provide linking capability for C and assembler programs, possibly as an optional module for the kit.

Lotus is also considering support for such applications as graphics in a future release, he said.

Expectations

Despite its few limitations and the necessity of learning its development language, users contacted by *Computerworld* said they were eager to use the kit.

Jeff Knepper, director of advanced technology-tax at Touche Ross & Co., said he is looking forward to the security advantage that the kit provides.

Touche Ross currently develops add-in functions by writing complicated macros, which are inherently limited in scope and difficult to secure from accidental or intentional tampering. "We've tried for the last several years to keep people out of our macros; all we can really do is make it difficult to get at them," Knepper said. Unlike macros, programs created with the kit are invisible to users.

Server

FROM PAGE 39

turned up the spotlight on throughput, response time and the number of concurrent user issues.

For example, during testing, SQL Server obtained a peak level of 10.5 transaction/sec. with five concurrent users, each generating a continuous stream of TP1 transactions. When the number of simultaneous users was bumped up to 40, SQL Server's throughput dipped to 7.8 TP1 transaction/sec. This compares favorably with conventional database management systems, which typically exhibit a sharp drop in performance as users are added, Kaplan said.

Users seeking either a reality check or verification of these results can obtain a free SQL Server Benchmarking Kit from Microsoft containing full benchmark details and a source-code disk.

An accompanying report detailing test specifications and results can be ordered from either Microsoft or Ashton-Tate.

The test itself was conducted during business hours on Microsoft's internal, 7,000-node Ungerman-Bass, Inc. LAN Manager Version 1.0-based Ethernet network. SQL Server Version 1.0 ran over an OS/2-based Compaq Computer Corp. 33-MHz Deskpro 386 outfitted with an internal 650M-byte hard disk, external 320M-byte hard disk and 10M bytes of memory. The client mix included DOS and OS/2 with varying memory and disk sizes.

Why ship OS/2 PM products?

Slow demand, lack of printer drivers stall Presentation Manager debuts

ANALYSIS

BY PATRICIA KEEFE
CW STAFF

An increasingly defensive Microsoft Corp. has taken to the offensive in an effort to still the growing chorus of critics complaining about the lack of OS/2 Presentation Manager applications. There are, of course, some PM applications available today, and Microsoft claims that many more will ship over the next three to six months.

However, some developers said they are in no rush to release their PM ports, citing the slow growth of OS/2.

Visionware Ltd., of Leeds, UK, for example, expects to have a PM version of Xvision, its Microsoft Windows-based server, ready early next year. "Whether we'll ship it then depends on the emergence of OS/2," said Tony Densen, Visionware's manager/director. He said that Visionware has found little demand for its other OS/2-based products, which are sold both here and in the UK: "There are just so few OS/2 users out there."

Jack Leach, president of Polaris Software Corp. of Escondido, Calif., agreed. "There are not a lot of people pounding on us to get PM," he said.

The PM applications that are out are not hot sellers, according to the Aug. 15 issue of "ACKnowledge The Window Letter," a Mendham, N.J.-based newsletter for PM developers and users. "The reason is simple — few printer drivers," according to the publication.

Leach said that sales of a PM version of Packrat, Polaris' personal information manager, have been indirectly affected by the lack of printer drivers. "It's been a real problem. It's too bad the overall market is tripping over printer drivers," he said. Microsoft was caught in a situation where it contracted to have generic printer drivers written by Bauer Enterprises, which in turn subcontracted the work to another programmer, according to "ACKnowledge." Microsoft has since purchased Bauer.

Also, IBM uses a print spooler developed for PM, while Microsoft has developed a different LAN Manager print spooler. This means that third-party LAN Manager-based OS/2 servers use different printing application programming interfaces than do IBM's LAN Manager-based OS/2 LAN servers.

These issues, coupled with a lack of core applications being moved to PM, all serve to create impediments to getting users to move to OS/2, Leach said.

Yet another reason PM applications are not selling is the fact that most of the PM software shipping today is composed mostly of developer tool kits or little-known applications, according to Nancy McSharry, an analyst with International Data Corp., market researchers based in Framingham, Mass.

Microsoft must be listening, because OS/2 Release 1.2 partially addresses these issues by adding printer support for Postscript and Epson printers. A PCL driver is slated for release in November.

As for the paucity of applications, that situation could shortly be reversed, based on the following Microsoft estimates on the delivery schedules for a host of PM programs, some from big-name vendors:

• In the next three months — IBM's Officevision (this month), Lotus Development Corp.'s Notesl, Aldus Corp.'s Pagemaker, Micrografx Designer, Digitalk's Smalltalk V and Virtual Machine's Visual Active, among others.
• In the next six months — Lotus Development Corp.'s 1-2-3G, Borland International's Paradox, Gupta Technologies, Inc.'s SQL Windows, Ventura's Ventura Publisher and Wordperfect's and Versacad's namesakes, among others.

Microsoft also ticked off OS/2 applications available today, including Interactive Image's Easel, Borland's Sidekick, MDBS' Object/1, Polaris' Packrat, Casework's Case:PM, Intelligent Environment's Applications Manager and a word processor from Describe, Inc.

Epson EPL-6000. HP emulation. 300 x 300 DPI. 6 PPM. 512KB RAM, expandable to 4.5MB. 6 resident fonts. Two option font slots. Enhanced SelecType control panel. One year limited warranty.

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HP LaserJet II is a registered trademark of Hewlett-Packard. Epson is a registered trademark of Seiko Epson Corporation. Epson America, Inc., 2780 Lomita Blvd., Torrance, CA 90505. **(800) 922-8911.**

With the new, affordable EPL-6000 from Epson, more businesses will be looking better on paper.

Opting for the quality of a laser printer has just become decidedly easier. Introducing the EPL-6000 laser printer from Epson.®

Coming from the company with the longest running success in the printer business, reliability is a given. What's more, the new EPL-6000 is compatible with application software written for the HP LaserJet II.®

As for value, this new Epson combines solid, businesslike performance with a price that is as attractive as the printing. In fact, for quality, reliability and value in a laser printer, you could say Epson has the solution well in hand.

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NEW PRODUCTS

Systems

A rechargeable battery system for laptops has been introduced by Gates Energy Products, Inc.

The C 2500MAH battery reportedly features rechargeable nickel-cadmium technology in a standard C size with a 2500MAH capacity rating. The system is said to give users three to four hours of runtime and uses standard charge rates. The cost is under $4 per cell, with OEM pricing available.

Gates Energy Products
Inquiry Fulfillment Dept.
P.O. Box 667850
Charlotte, N.C.
28266-9961
800-627-1700

AST Research, Inc. has expanded its line of AST Premium 386/25 and Premium/386C computers.

According to the company, the 25-MHz Premium 386/25 Model 115V and the 20-MHz Premium/386C Model 3110V offer a 110M-byte IBM Personal Computer AT-embedded fixed drive as well as the AST-Video Graphics Array Plus 16-bit graphics adapter. The AT-embedded drive provides a 16 msec average access time and a 10M-bit transfer rate. Both systems are configured with 2M bytes of random-access memory.

The Premium 386/25 Model 115V costs $7,595; the Premium/386C Model 3110V costs $6,695.

AST Research
2121 Alton Ave.
Irvine, Calif. 92714
714-863-1333

NCR Corp. has announced two desktop personal computers targeted for general-business software users.

Designed to enhance spreadsheet, database and desktop publishing applications, the NCR PC386SX and NCR PC386SX/MC are based on the Intel Corp. 32- and 16-bit 386SX microprocessor. The basic model PC386SX reportedly runs at 16 MHz and offers 1M byte of random-access memory. It is priced from $3,195.

According to the company, the PC386SX/MC desktop system is based on IBM's Micro Channel Architecture and includes a 16-bit small computer systems interface controller on fixed-disk models. A basic system retails for $3,145.

NCR
1700 Patterson Blvd.
Dayton, Ohio 45479
513-445-5000

Toshiba America Information Systems, Inc. has announced an Intel Corp. 80386SX-based portable personal computer.

Designated the T3200SX, the 17-pound system offers 32-bit processing, six expansion slots and a 13M-byte memory capacity.

According to the company, the product provides a platform for advanced OS/2 and Microsoft Corp. Windows/386 multitasking operating environments. It is priced at $6,299.

Toshiba America
Information Systems
9740 Irvine Blvd.
Irvine, Calif. 92718
714-583-3000

Software utilities

Tallgrass Technologies Corp. has introduced a menu-driven tape backup utility and archival management program.

Filesecure uses data compression to increase the capacity of each tape, decreases file-by-file backup time and was designed to support a wide variety of personal computer and backup devices.

Available now for customers using the company's QIC 100 technology, the utility is offered as a software upgrade to Tallgrass' installed base, the company said.

Tallgrass Technologies
11100 West 82nd St.
Overland Park, Kan. 66214
913-492-6002

Shortcut Software, Inc. has introduced six "personal-convenience" software products designed to address file handling and maintenance tasks without reverting to DOS commands.

Disk/Director is said to help manage files and directories, Word/Find locates any word in one or more files, while File/Find locates lost files and can list all files created in a given number of days.

According to the company, Lock/File provides password access to files, Pack/File saves disk space by providing data compression, and View/File enables the user to browse files without going through the original application program. Operating on IBM Personal Computers and most compatibles, each package sells for $24.95.

Shortcut Software
Suite M
7525 Ethel Ave.
North Hollywood, Calif.
91605
818-503-0927

Peripherals

A Tempest desktop ink-jet printer has been introduced by North Atlantic Industries, Inc.

The Deskjet-T, the Tempest version of the Hewlett-Packard Co. Deskjet ink-jet printer, reportedly accepts HP Deskjet font cartridges, soft fonts and accessories for alphanumeric and graphic printing. According to the company, the printer also connects with a variety of other systems, including those from IBM and Apple Computer, Inc. An optional Epson America, Inc. emulation cartridge permits use in many Epson-compatible applications.

The price is $2,990.

North Atlantic Industries
60 Plant Ave.
Hauppauge, N.Y. 11788
516-582-6500

Output Technology's *Model 2132 prints at 300 line/min.*

Output Technology Corp. has announced the addition of a 300 line/min. printer to its 2100 series printer line.

Targeted at single and multiple personal computer users, the Model 2132 features built-in bar codes, dot-addressable graphics, serial and parallel interfaces, multiple printer emulations and a 16-char. by two-line LCD, the company said.

The printer offers correspondence-, graphics- and near-letter-quality print modes, the company said. The retail price is $3,995.

Output Technology
East 9922 Montgomery
Drive
Spokane, Wash. 99206
509-926-3855

RGB Technology has introduced an autosynchronous scan converter that converts the graphic output of the IBM Personal Computer, Personal System/2 and Apple Computer, Inc. Macintosh to television video.

The RGB/Videolink 600 is said to automatically synchronize with IBM's Enhanced Graphics Adapter (300-line), Video Graphics Array (all modes) and Macintosh II (480-line) systems.

According to RGB, the converter incorporates anti-aliasing, full 24-bit color processing and real-time operation.

The price is less than $10,000, the vendor said.

RGB Technology
2550 Ninth St.
Berkeley, Calif. 94710
415-848-0180

Facit, Inc. has added a midrange series to its line of dot matrix printers.

The B2000 series reportedly includes 9- and 24-pin printers that allow the feeding of a variety of types of paper without jamming. The 80-column B2100 and 136-column B2150 are 9-pin printers with print speeds of 240 char./sec. that sell for $499 and $649, respectively. Fonts, printer emulations and setups are available using Facit's optional font cards.

For letter-quality printing, the 80-column B2400 and 136-column B2450 feature 24-pin printheads with printing speeds of 240 char./sec. in draft mode and 78 char./sec. in letter-quality mode. The prices are $699 and $849, respectively.

Facit
University Center
400 Commercial St.
P.O. Box 9540
Manchester, N.H.
03108-9540
603-647-2700

Macintosh products

Microtouch Systems, Inc. has released a 3- by 4½-in. touch-sensitive tablet that replaces the mouse for the Apple Computer, Inc. Macintosh.

According to the firm, the user slides his finger over the glass top of the Unmouse to move the cursor, pressing on the tablet to click the mouse button. Because the one million touch points are said to map directly to the pixels on the screen, the stylus enables the user to draw, annotate documents, enter signatures or trace images. Templates reportedly let the Unmouse function as a keypad for software such as Microsoft Corp.'s Word and Excel. Ordered directly from Microtouch, the price is $235.

Microtouch Systems
55 Jonspin Road
Wilmington, Mass. 01887
508-694-9900

Archive Corp. has introduced a tape backup subsystem for Apple Computer, Inc.'s Macintosh.

The external Maxstream MS2200E tape drive reportedly offers as much as 2.2G bytes of storage capacity on a single standard 8mm cassette for the Macintosh Plus, SE, SE/30, II, IIX and IICX computers. The unit can provide a rapid data transfer rate of up to 13.4M byte/min. according to the company.

Slated for release in October, the Maxstream MS2200E will retail for $6,695 and will include a one-year warranty, the company said.

Archive
1650 Sunflower Ave.
Costa Mesa, Calif. 92626
714-0641-0279

Crosfield Design Systems has introduced digital film recorder output and video camera input for its Apple Computer, Inc. Macintosh-based color layout system.

The Matrix Slidewriter recorder reportedly allows the user to edit and produce either 2,000 or 4,000 line/in. 35mm slides when using the company's Lightspeed Color Layout System. The price is listed at $13,750.

According to the company, the Camera Input Option allows designers to capture images in real time from a video camera. Other features are said to include a zoom lens and the ability to accept input from VHS recorders and still-frame video cameras. The video frame-grab option sells for $12,500.

Crosfield Design Systems
65 Harristown Road
Glen Rock, N.J. 07452
201-447-5800

Software applications packages

Data analysis software for The Santa Cruz Operation Xenix-based Intel Corp. 80386 personal computer has been introduced by SPSS, Inc.

Called SPSS-X, the software package integrates the functions of data management, file management, statistical analysis, table and chart creation, and time series and forecasting. The one-time fee of $2,000 includes a year of technical support and automatic upgrades.

SPSS
444 N. Michigan Ave.
Chicago, Ill. 60611
312-329-3313

Daytron Electronics, Inc. has announced computer-aided flowcharting.

Release 2.0 of Turboflow reportedly enables the user to build his own symbol library. It can display an entire drawing, has a mouse option and produces files compatible with desktop publishing and painting software. The program adjusts to 18 paper sizes, supports a variety of plotters and can print up to four pages without page breaks.

The price is $89 with a mouse and $69 without one.

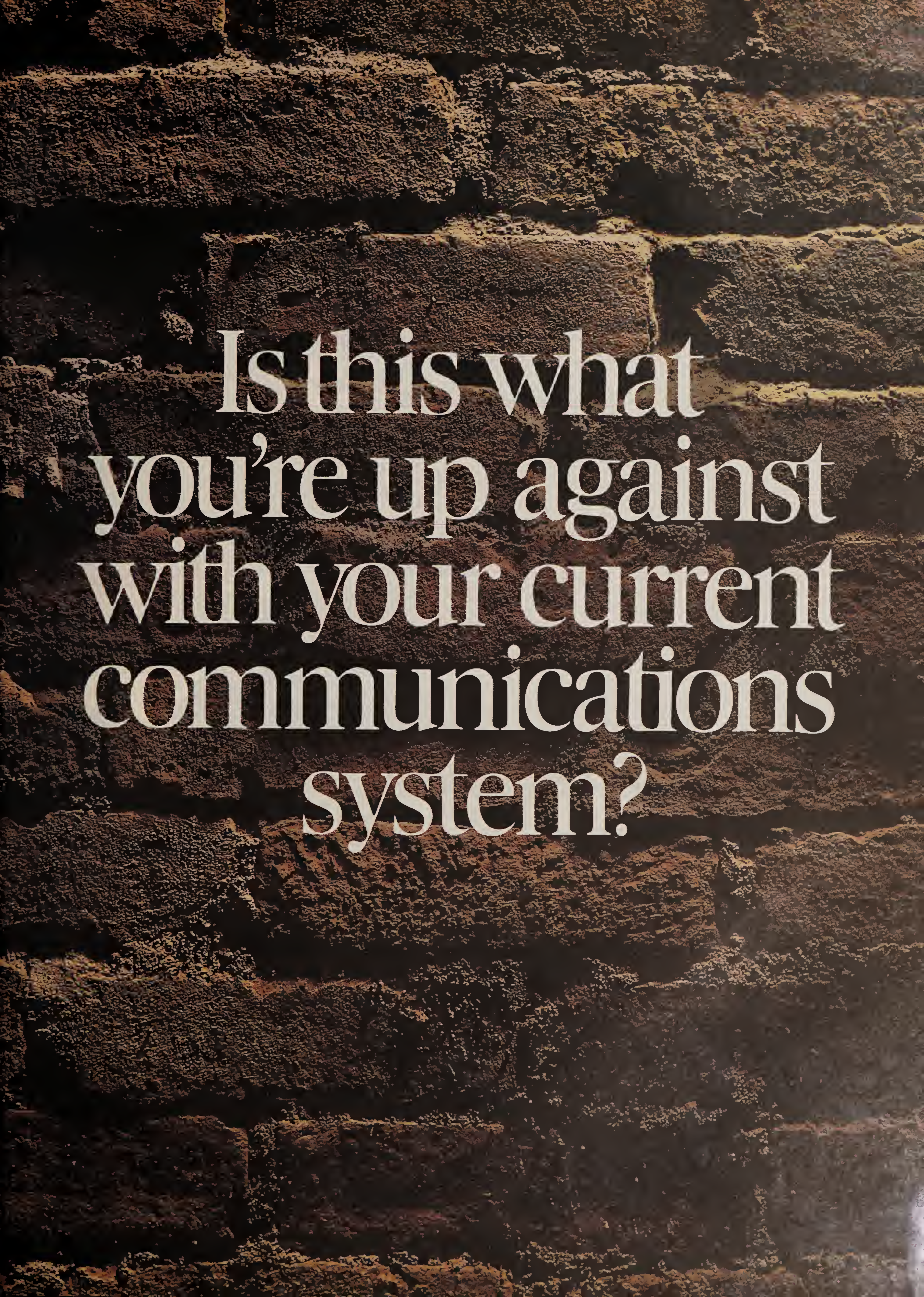
Daytron Electronics
610 S. Sherman, No. 104
Richardson, Texas 75081
214-669-2137

A software package for use with data acquisition systems in IBM Personal Computers has been presented by Preston Scientific.

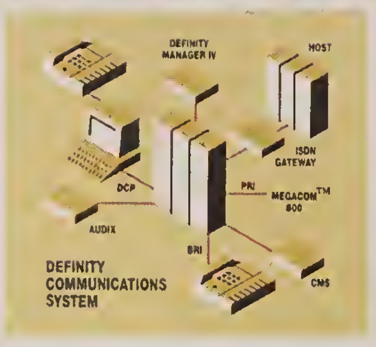
Signalys provides expanded capabilities for data conditioning, analysis and display, the company said. The menu-driven program can reportedly handle up to 200 data channels at a time, display as many as 16 windows simultaneously and generate reports through standard word processing packages.

The basic price is $1,500 with optional application and interface modules available.

Preston Scientific
805 E. Cerritos Ave.
Anaheim, Calif. 92805
714-776-6400


Is this what
you're up against
with your current
communications
system?

AT&T opens up endless possibilities wit



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he DEFINITY Communications System.

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To keep your operations up and running, AT&T's *DEFINITY™ MANAGER* Products for system management provide these important features: consistent user interface across our product line, so you can move to more sophisticated functions and keep a lid on re-training costs; standardization on a commercially available database management system to give you added flexibility; and a flexible, modular architecture, that reduces installation costs and allows you to grow into a new system without starting over. So if your old PBX has brought you to a dead-end, the DEFINITY Communications System can turn your fortunes around.

To find out more about the DEFINITY Communications System, contact your AT&T Account Executive, or call 1 800 247-1212, Ext. 176. In Canada, call 1 800 387-6100. For PBX technology, it's a breakthrough.

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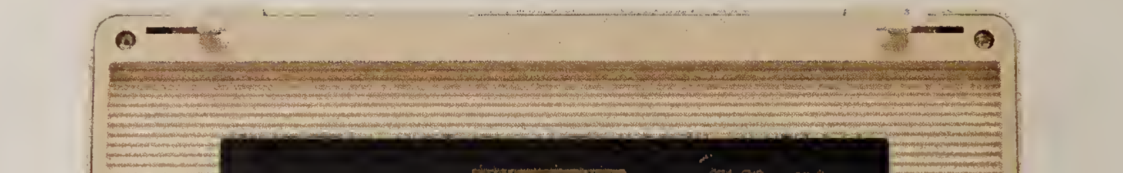

The Informer 213 portable terminal.

The only light weight 3178 compatible terminal designed specifically to provide remote access to your IBM 3270 environment. Nothing offers you a more complete solution.

This compact little eight pound powerhouse includes a built-in synchronous modem that operates up to 9600 baud and emulates a 3274 control unit with an attached 3178 Mod 2 terminal. Making communications to the host computer as simple as plugging into any RJ-11 phone outlet and striking a single key.

The Informer 213 lets you establish a low cost dial-in network over standard or leased lines with the data integrity of SNA protocols.

So you'll always feel at home when you're away, we designed the 213 to perform and feel just like your 3178 terminal. From the detachable 3270 compatible keyboard, to the electroluminescent 80 character by 25 line screen with status line. It's all there.

If you've been looking for a portable 3270 solution that's as strong on communication as it is on compatibility, give us a call at (714) 891-1112.

We think you'll be surprised when you see what a great little suggestion the 213 really is.

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Computer Terminals, Inc.

Informer Computer Terminals, 12781 Pala Drive, Garden Grove, California 92641.
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IBM is a registered trademark of International Business Machines Corporation.

DATA STREAM

Elisabeth Horwitt

At your service

When a corporation picks and holds on to a T1 vendor, the biggest reason seems to be good service.

Service can and should mean a number of things — like when something breaks, your vendor quickly sends someone out to fix it. Avanti may have a chance at recovering from the mess it has been in for the last couple of years, because the small company has been providing good service — even while its switches have been on the fritz.

Westminster National Bank, for instance, held onto Avanti's ONX 5000s during the last two years, even though the high-end T1 switches were apparently prone to routing glitches. Why? Because Avanti people got there fast when a problem came up, and they stayed there until the problem was fixed, according to Brian Siegel, the bank's vice-president of data communications.

Westminster's communications people got access to "the people who pushed the buttons at Avanti; we got the ears of their engineers," which might not have happened at a bigger vendor, Siegel said.

Continued on page 57

Sun leads trio in RPC proposal

Standard remote procedure calls will benefit developers and users

BY PATRICIA KEEFE
CW STAFF

DALLAS — If developers take the bait, users fishing for distributed, networked applications that play across heterogeneous hardware and software platforms could find some relief within the next 12 months.

Two weeks ago, a trio of vendors led by Sun Microsystems, Inc. launched an effort to promote a standard for a transport-independent remote procedure call (RPC) said to provide a smooth migration path to Open Systems Interconnect protocols.

RPCs are used to split an application into client and server parts, shielding developers from having to deal with lower level network protocols and thus speeding up the porting process.

Sun, along with partners Netwise, Inc. and Novell, Inc., detailed plans to incorporate support for the development platform, which is called the Common Distributed Computing Platform (CDCP), in upcoming releases of specific products, including Novell's Portable Netware and Netware 386.

The payoff for end users is simple. If developers can write one application that will run unmodified over multiple networks, then they will be more willing to port their stand-alone applications to a distributed, or client/server, environment.

"This announcement spells r-e-l-i-e-f for us," said Michael Prince, MIS director for Burlington Coat Factory Warehouse Corp., a discount apparel chain with 146 outlets nationwide. Burlington already uses RPC and distributed computing technology throughout its operations. "This common platform will allow [us] to push forward with more distributed applications," Prince said.

If sufficient support is generated within the industry, developers will be able to go a step further, producing distributed applications that will run across a mix of operating systems, hardware processors and transport layers.

"This effort will make it easier for Lotus and other applications developers to provide truly distributed applications [in a mixed environment]," said Frank Moss, vice-president of Lotus Development Corp.'s Networked Applications Systems Division.

A less direct impact also benefits users: No longer will they have to keep track of different network versions of an application. Retailers will also be spared that task, simplifying their inventory. In turn, users may expect to be able to choose from a greater mix of shrink-

Continued on page 59

AT&T fights back, pressures FCC

ANALYSIS

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — AT&T, using legal tactics made famous by archrival MCI Communications Corp., is applying pressure to the Federal Communications Commission to re-evaluate AT&T's status as a regulated "dominant" carrier.

AT&T has made no secret of its frustration with the current regulatory regime, in which its tariffs are strictly controlled by the FCC and fought by competitors who can delay an AT&T service by challenging the tariff.

However, after months of intense criticism of its Tariff 12 offerings to big businesses, AT&T is fighting back. Last month, AT&T filed an artfully worded, formal complaint challenging MCI's pricing strategy [CW, Aug. 14].

On its face, AT&T's complaint charged that MCI has failed to file tariffs — as required by the Communications Act of 1934 — to reflect discounts provided to large customers, such as the 8.5% discount provided to Merrill Lynch & Co. a few months ago [CW, June 12].

Other untariffed services were provided to Westin Hotel Co., United Airlines, the U.S. Department of Defense, the University of Colorado at Boulder and Uniguard Insurance Co., AT&T's complaint said.

On another level, the complaint represented a criticism of the FCC's 1983 policy of classifying AT&T as a dominant carrier that must be strictly regulated and classifying others as nondominant carriers that need little scrutiny.

In that respect, the complaint is the initial skirmish in what may be a major political battle of the 1990s: the deregulation of AT&T. Users recognize that AT&T is facing more competition than ever, but they are wary of giving AT&T any more freedom than it already has gained under the new price caps regime [CW, March 20], said Brian R. Moir, counsel to the International Communications Association.

George R. Dellinger, a telecommunications analyst at Washington Analysis Corp., a securities research firm in Washington, D.C., reported that the AT&T complaint has two ramifications.

First, AT&T is increasing pressure on the FCC to address the looser regulatory treatment accorded nondominant carriers. Under a recently enacted law,

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Inside

- A bridge *and* a router. Page 53.
- Networld vendors promise rollout competition. Page 55.
- Prodigy visits Chicago neighborhoods. Page 59.

New Version!

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- *binary editing*
- *directory/member lists*
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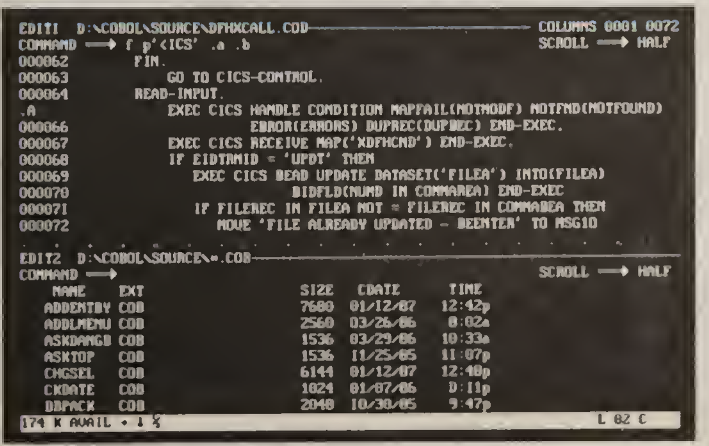
- *50-line VGA*
- *user interface*
- *utilities*
- *network support*



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COMMAND ──→ f p'<ICS' .a .b                           SCROLL ──→ HALF
000062       FIN.
000063           GO TO CICS-CONTROL.
000064       READ-INPUT.
.A               EXEC CICS HANDLE CONDITION MAPFAIL(NOTMODF) NOTFND(NOTFOUND)
000066                     ERROR(ERRORS) DUPREC(DUPREC) END-EXEC.
000067           EXEC CICS RECEIVE MAP('XDFHCND') END-EXEC.
000068           IF EIDTRNID = 'UPDT' THEN
000069              EXEC CICS READ UPDATE DATASET('FILEA') INTO(FILEA)
000070                        RIDFLD(NUMB IN COMMAREA) END-EXEC
000071              IF FILEREC IN FILEA NOT = FILEREC IN COMMAREA THEN
000072                 MOVE 'FILE ALREADY UPDATED - REENTER' TO MSG10
EDIT2  D:\COBOL\SOURCE\*.COB─────────────────────────────────────────
COMMAND ──→                                           SCROLL ──→ HALF
   NAME     EXT                  SIZE   CDATE     TIME
   ADDENTRY COB                  7680  01/12/87  12:42p
   ADDLMENU COB                  2560  03/26/86   8:02a
   ASKDANGB COB                  1536  03/29/86  10:33a
   ASKTOP   COB                  1536  11/25/85  11:07p
   CHGSEL   COB                  6144  01/12/87  12:48p
   CKDATE   COB                  1024  01/07/86   D:11p
   DBPACK   COB                  2048  10/30/85   9:47p
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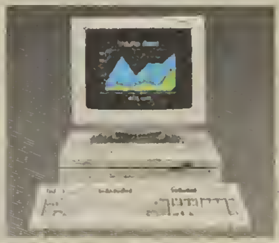

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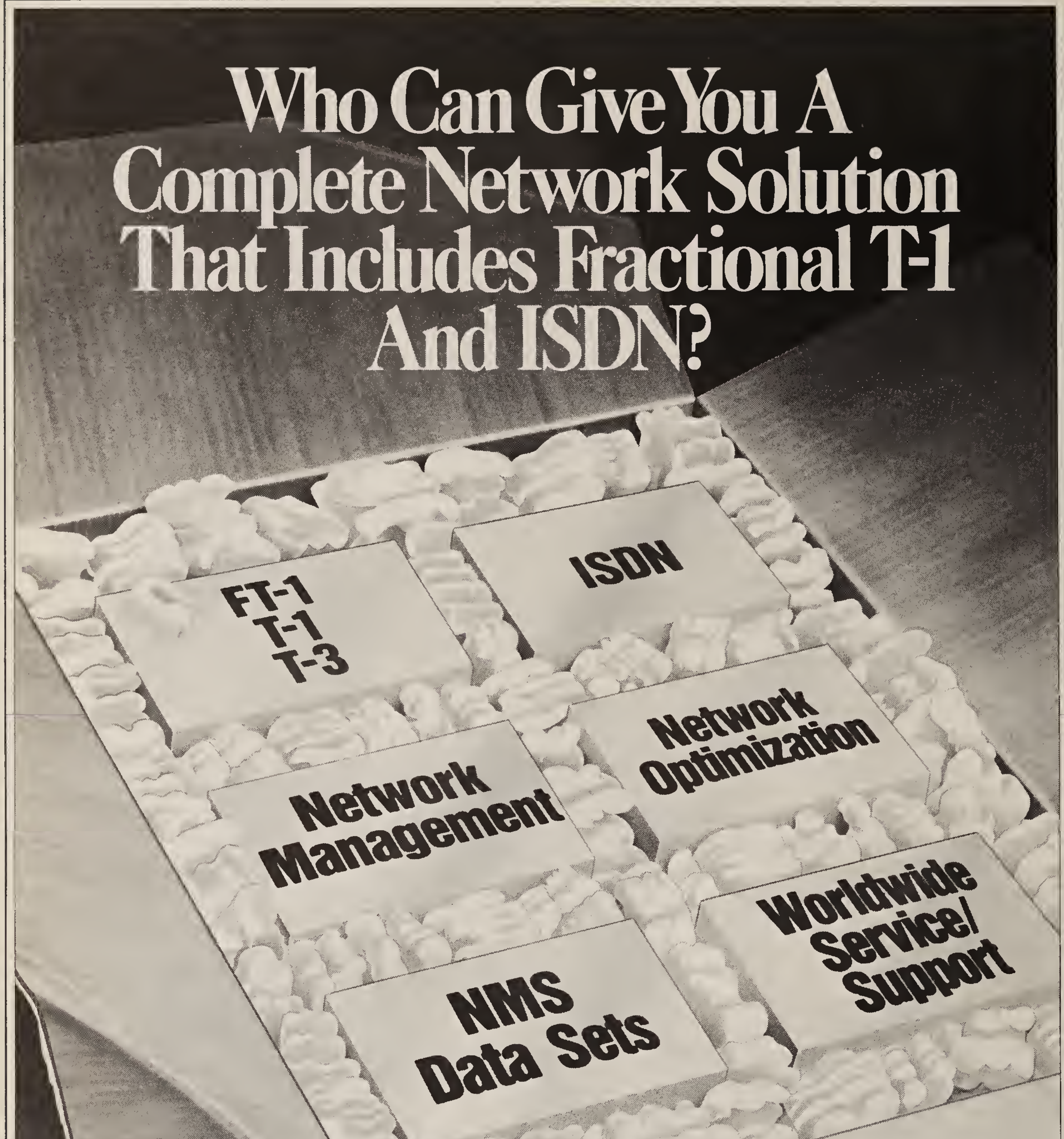

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Finding a brouter that does it all

Laclede Gas meets net demands with Halley's Connectlan 100

ON SITE

BY JOANIE M. WEXLER
CW STAFF

ST. LOUIS — When Laclede Gas decided to integrate its four Ethernet local-area networks with T1 links nearly a year ago, it had a few specific demands for the bridging product it would select.

First, the company needed the protocol independence of a bridge because it had future plans to implement Transmission Control Protocol/Internet Protocol across its network but was still using the Xerox Network Services protocol.

"We wanted to make sure we didn't run into any compatibility problems down the road," explained Laclede's superintendent of computer applications, Harry Haury.

At the same time, the company desired more intelligent router functions, such as distributed load sharing and source and destination filtering for enhanced security. Laclede also wanted a product that was based on an industry-standard platform, according to Haury.

The company chose Connectlan 100 brouters from Halley Systems, Inc., which are made by RAD Network Devices.

A T1 line with three of the brouters was installed in the company's home office last year. From those brouters, Laclede connected T1 links to three remote stations.

The load-sharing feature, Haury said, benefits the company because as the data traffic shifts, the brouters dynamically allocate bandwidth, which "provides us with optimum performance."

More control

The source and destination filtering feature allows the definition of access levels for each node. "We can specify, for example, that node two cannot access node 16," explained Haury. At the time that Laclede conducted its evaluation of bridging products — from Bridge Communications, Inc., Crosscom Corp., Halley, Raycom Systems, Inc. and Vitalink Communications Corp. — "quite a few of the vendors supported destination filtering, but none besides Halley supported source filtering, as well," Haury said.

The Halley product is based on an IBM Personal Computer AT with a T1 interface card, allowing Laclede to "maintain a lot of the computer system ourselves."

Laclede's Haury *gets optimal performance with Connectlan*

Haury justified the brouter selection, noting that "we got a highly functional brouter for about the cost of a bridge; the product's cost/performance ratio was far better than anyone else's at the time." The brouter ranges in price from $9,000 to $14,000, depending on the number of links supported and options selected, according to Halley.

The product, Haury added, was "extremely easy to install and was user-transparent. We haven't had so much as a hiccup with it." Haury acknowledged that "we wish the product had better hooks into the CSU/DSU [channel service unit/digital service unit] for running diagnostics across the network. Right now, we're unable to diagnose a failure in a link."

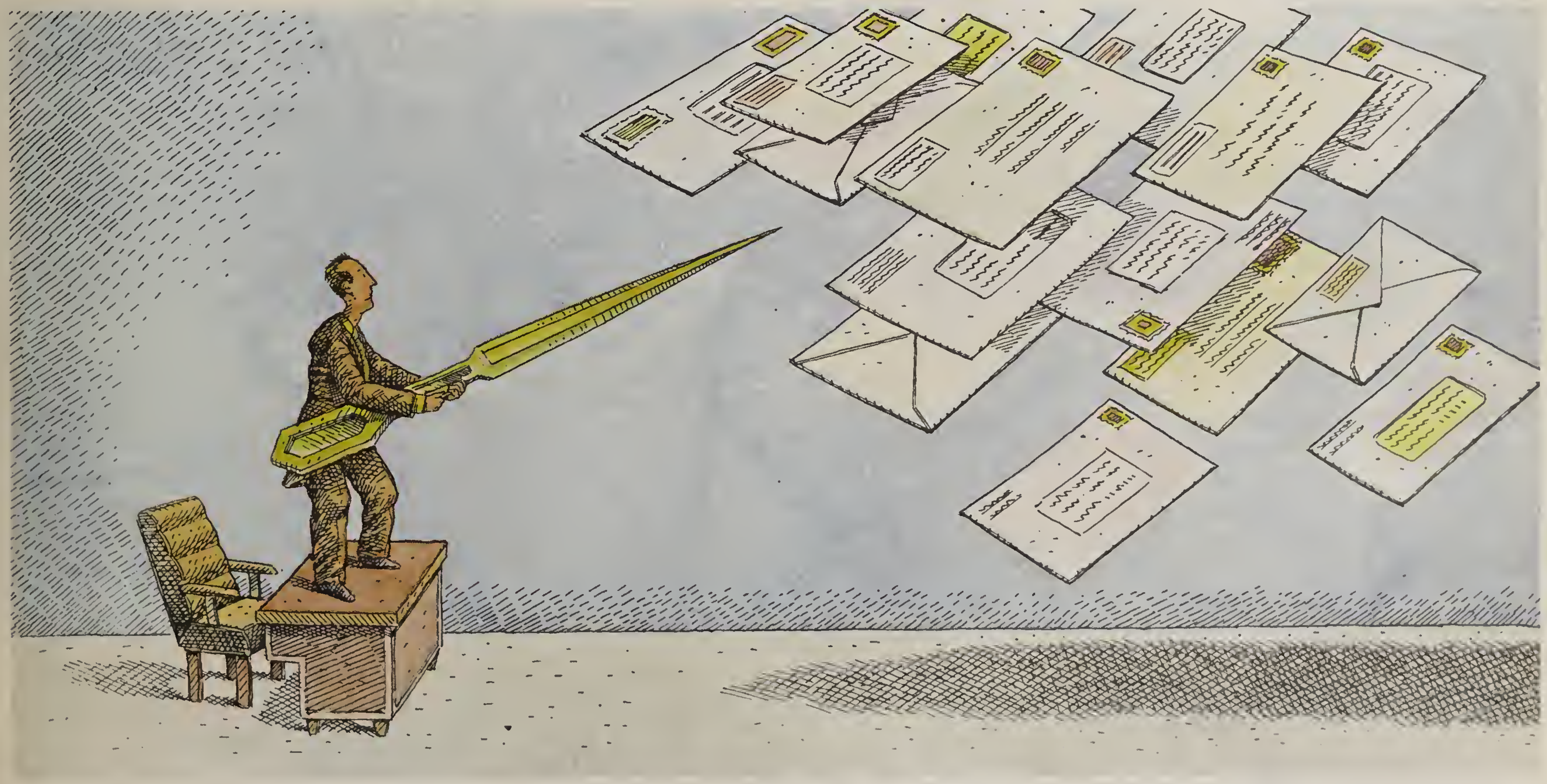
To that end, the vendor is currently offering Connectview, a network management system running Microsoft Corp.'s Windows that was announced last May to monitor the brouters.

"The system will sound an audible alarm, so you don't have to be sitting in front of the station," said Vasant Acharya, Halley's product marketing manager for the Connectlan 100. "Laclede isn't using the product at this time, but it would solve the problem of monitoring the T1 link. We are currently working on providing hooks into the CSUs/DSUs, but we don't have a timetable for completing that yet."

"Connectview is very good," Haury responded, "but it doesn't handle communications with the CSU/DSU for loop-back testing. For us, with a fairly simple, point-to-point network, the system isn't worth the cost [$10,000]. Connectview would be much more useful in a more complex network."

Acharya added that a custom filtering mask, also new to the brouter since the Halley implementation, "allows all bad traffic to run on link A and all interactive traffic to run on link B, so the interactive traffic doesn't experience delays," he said. The T1 network now handles all Laclede's applications. For example, in order to improve customer service, the company installed a system to track gas connections. The system required enough bandwidth for exchanging images, such as construction drawings, between remote and local sites and for distributed database sharing among the four locations.

Previously, the local and remote sites were linked by a 3Com Corp. 3+ remote ASCII interface and 9.6K bit/sec. modems, which accommodated batch file transfer and did not allow remote users to use the database interactively in the same manner that local users could.



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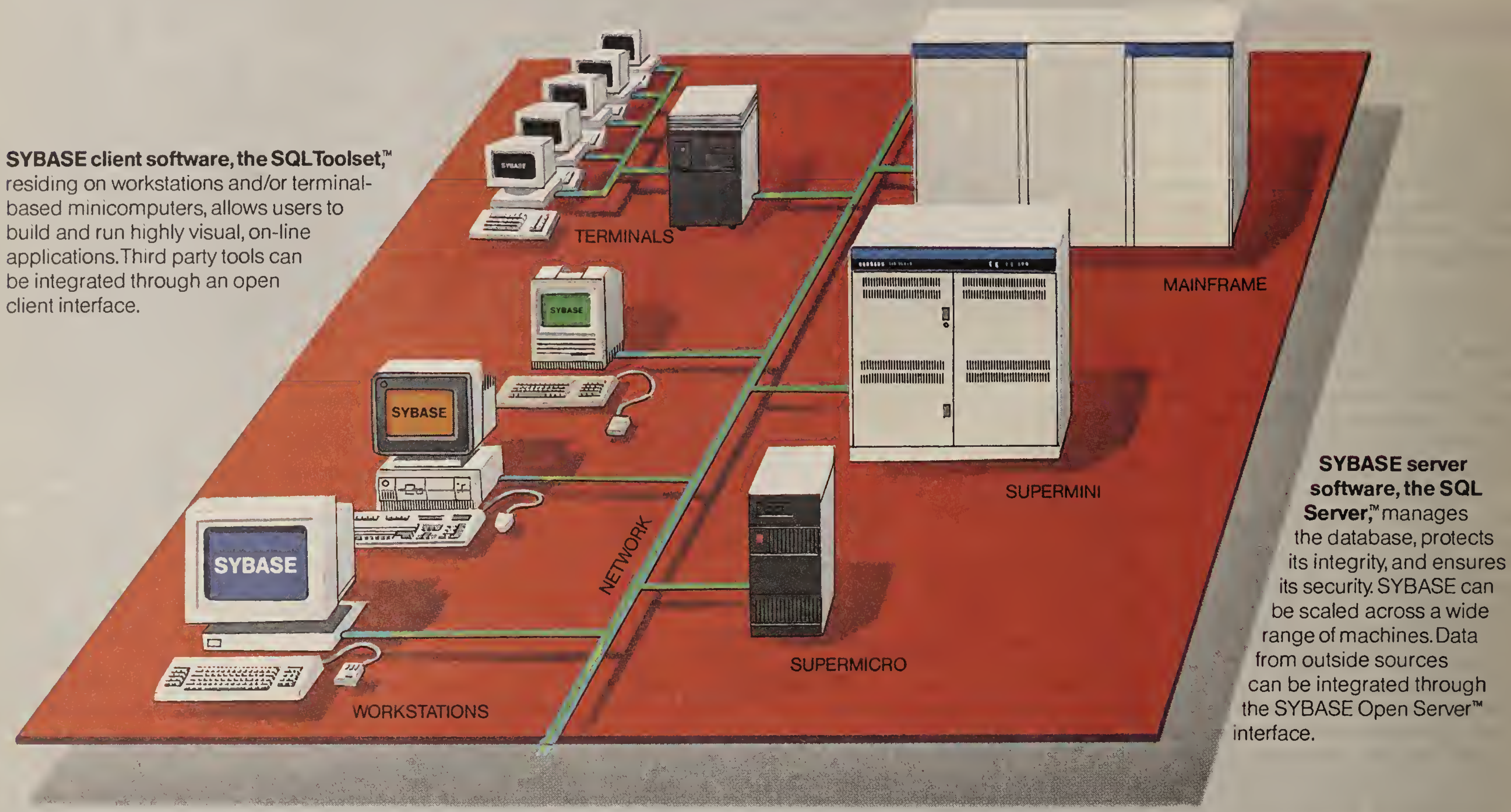

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Plans, not products, highlighted in major vendors' Networld pitches

BY CHARLES VON SIMSON
CW STAFF

DALLAS — Although short on deliverables, major vendors were quietly stumping in the wake of Networld '89 for product developments that they say will add significantly to their competitive positioning within the next 12 months.

Digital Equipment Corp. and Motorola, Inc. announced that the latter company would market several DEC chip designs based on Fiber Distributed Data Interface (FDDI) standards for 100M bit/sec. network communications as well as several of its own designs. The new chips are slated to be available in 1990.

"We have worked with them on the design and will announce a block of FDDI bridge products based on the chip within the next year," a DEC FDDI marketing manager said. "We expect they will be among the first FDDI products on the market."

DEC will get the first shipment of the chips, but several other communications vendors have also expressed early interest, Motorola sources said.

Current FDDI products are based on chips by Advanced Micro Devices, Inc., a Sunnyvale, Calif., chip manufacturer. The market for the chips is currently confined to small evaluation samples being used by device manufacturers.

Analysts said that while the FDDI market showed promise, mature end-user demand was two to three years away. As prices drop, the technology will become increasingly cost-effective for high-speed backbone applications. Desk-to-desk communications will benefit as well, as advanced workstations requiring increased speed and bandwidth proliferate.

Oracle Corp. officials said the company's newly formed network products division will immediately begin to market an unbundled version of the company's SQL Net, a remote procedure call software system that has been a separately priced part of the company's relational database management system.

It is also likely that the company will enter the network management system market within the next two years, according to Donald "Smokey" Wallace, vice-president of the division.

If the company continues with that plan, it will face growing barriers to entry in the next several years. "The credibility and installed base of vendors already in the market are already large," said Cecilia Brancato, network analyst at Oppenheimer Co. in New York. "And the technology is moving fast enough that if Oracle is planning for today's environment, they might end up missing the boat."

AT&T

CONTINUED FROM PAGE 49

the FCC must respond to the complaint within one year.

Secondly, AT&T may be trying to force MCI and other competitors to adhere to their published tariffs, thus reducing their ability to strike secret, off-tariff deals. AT&T's special deals must be disclosed in publicly available tariffs, so the discount rate quickly becomes the standard requested by other customers.

AT&T "wants to point out that MCI can change its prices without FCC investigation, whereas AT&T, if it hiccups, gets investigated by the FCC," said Alan Pearce, president of Information Age Economics, Inc., a telecommunications research firm in Bethesda, Md.

An MCI spokeswoman acknowledged that MCI does not file tariffs on custom services provided under contracts but denied that MCI has done anything improper. She said the complaint "really is just a smoke screen to help AT&T achieve their own deregulation."

The AT&T complaint, in essence, challenges the FCC's 1983 "forbearance doctrine." It holds that nondominant carriers need not file tariffs nor seek FCC permission to offer services.

Now, AT&T is arguing that the forbearance doctrine is fundamentally inconsistent with the Communications Act, which holds that all carriers must file tariffs regardless of their market power and that the rates must be reasonable and nondiscriminatory. "MCI and other competitors have gained unwarranted advantages in the marketplace by selectively providing services on an off-tariff basis," AT&T charged.

When MCI keeps the transaction secret by avoiding a published tariff, AT&T has little information on which to base a competitive bid, according to a report by Valucom, Inc., a telecommunications consulting firm in Vienna, Va.

On a separate track, Pearce said he anticipates that the FCC will launch a proceeding to re-evaluate AT&T's regulatory status. "I think it's inevitable. AT&T wants it . . . and I have no doubt that a majority of the current commissioners want it," he said. "The Notice of Inquiry will be biased in favor of deregulation, because most of the commissioners are in favor of deregulation."

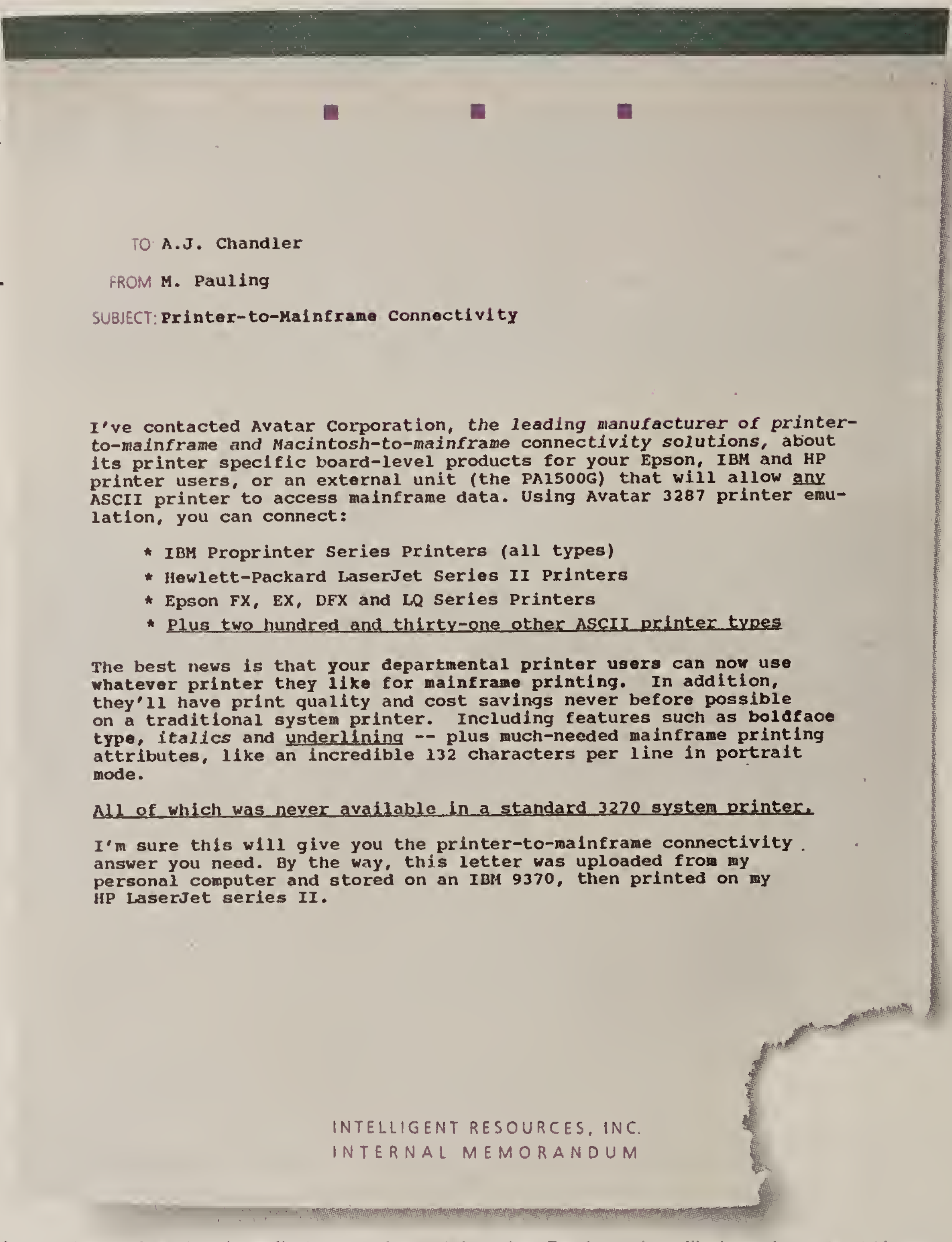
However, any move toward further deregulation of AT&T is likely to anger members of Congress at a time when FCC Chairman Alfred C. Sikes has vowed to keep peace with Capitol Hill.

Users are eager for the FCC to conduct an unbiased, comprehensive study of the economic and technical characteristics of the interexchange market, said Richard A. Fazzone, telecommunications affairs manager at GE Information Services, a unit of General Electric Co. in Rockville, Md.

However, he cautioned: "Many users have been critical of the regulatory process in recent years when the conclusion is reached [first], and then they start looking for facts to justify it."

"Our inventory and distribution problems won't go away until we get a system meant to solve them."

"If that came out of our mainframe, I'll eat it."



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BIT BLAST

OSI forum picks new head

The **OSI/Network Management Forum** recently elected British Telecom's Keith J. Willetts to succeed AT&T's John A. Miller as president. Willetts, who heads British Telecom's managed communications systems unit, served as vice-president and technical director during the forum's first year.

U.S. Sprint Communications Co. fired another shot in the T1 rates war recently, announcing that it will reduce rates for its Clearline 1.5 private T1 service up to 28%, effective Nov. 1. "We're just trying to maintain our price lead," a company spokesman said.

The Electronic Data Interchange (EDI) **Association** in Alexandria, Va., has begun an independent study to analyze the potential impact on U.S. users of the United Nations' international EDI standard. The study, which will include extensive user interviews, will be conducted by Mountain View, Calif., research firm Input and will be presented at the 21st National EDI Systems Conference and Exhibit in Washington, D.C., in December.

Digital Communications Associates, Inc. announced that it has become the first licensee of **Digital Equipment Corp.'s** Local-Area Transport specifications. DEC recently announced that it would license the proprietary protocol to other vendors, making it easier for non-DEC terminal servers to access DEC hosts, and for non-DEC hosts to become accessible via the protocol.

AT&T filed two more Tariff 12 contracts recently: a $40 million contract with **Allied-Signal, Inc.** and a five-year contract, valued at up to $100 million, to upgrade **Unisys Corp.'s** internal digital network. Unisys expects to save $12 million annually as a result of the upgrade.

Horwitt

FROM PAGE 49

It would have happened at NET, though, industry sources claim. NET holds about one quarter of the T1 market, and its revenue continues to skyrocket, because the company convinced its investors to spend more than $11 million up front on service alone, according to *Total Customer Service, The Ultimate Weapon,* a recently published book by William H. Davidow and Bro Uttal. NET gets problems on its switches fixed within two hours after the customer calls in a complaint, which gives the vendor great word-of-mouth referrals, the book states.

Good service is also important before the actual sale, when the customer is trying to figure out how to optimize a complex network in terms of cost, reliability and response time. Several T1 vendors have been tailoring network design packages from companies such as Make and Quintessential and either selling the software to the user or giving it to their salespeople as a value-added service.

NET, for example, sells Make's package and sends it out with salespeople to help generate proposals for customers. The package is clearly an effective sales tool because it "gives customers confidence that the network will have the level of performance they require," a NET spokeswoman said.

NET's version of the product just handles NET switches right now, but plans are in the works to extend the tool to handle packet-switching and multiplexer equipment from NET subsidiary Comdesign, as well as LAN bridges and routers from NET partner Cisco, the NET spokeswoman said.

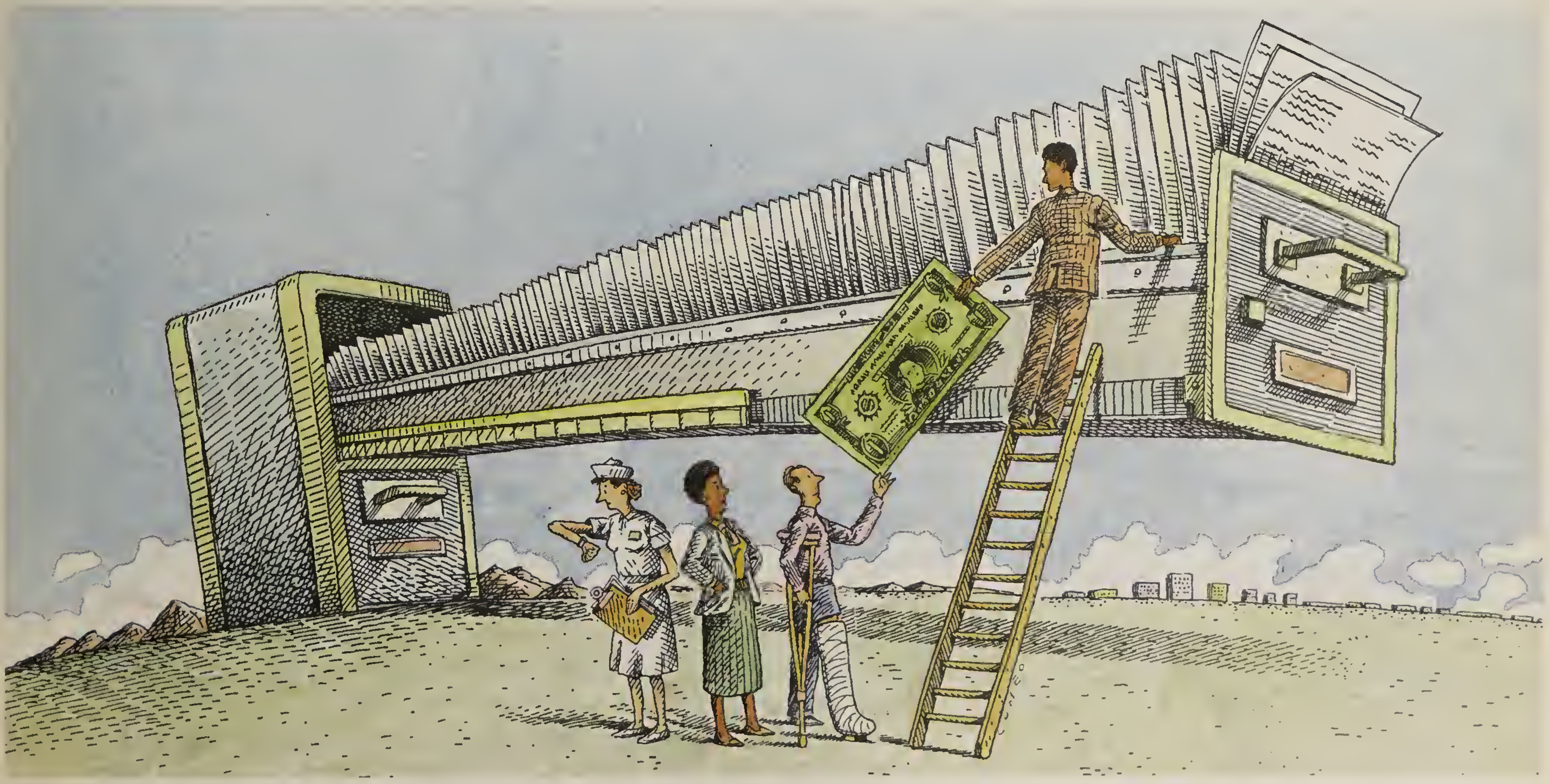
Infotron went a step further, recently announcing a free consulting service that reportedly goes in and recommends the best configurations of networking equipment for the customer without specifically recommending Infotron equipment. Of course, the consultants talk about products that Infotron happens to sell — like fractional T1, multiplexers and LAN bridges — but they also have specialists in carrier-based services. "Free" consulting is their edge for establishing good will with accounts that may already have somebody else's equipment, an Infotron spokesman said. Hey, it could work.

Lack of good service — before and after the sale — may be one reason why Cohesive, once considered one of the hottest T1 vendors around, is apparently about to be put on the block. DCA bought the company to round out its communications product line but apparently has not put enough resources into leveraging Cohesive's technology with good marketing and support. DCA sells Irma boards that link terminals to hosts; T1 switches are a sideline to the vendor, and users apparently got that message. Nobody survives today's T1 market without full product line commitment.

We're at that very hairy stage in the telecommunications game when the rules keep changing, new technology appears every day, nasty rate wars are going on, and standards may or may not be establishing themselves. Thus, it is harder for communications managers to make effective buying and configuration decisions.

So, vendors whose sales and support people can give the user useful, semi-disinterested (well, semi-semi-disinterested) advice on how to put the right mix of products and services into an effective network will be more than welcome — and successful.

Horwitt is *Computerworld's* senior editor, networking.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Prodigy blows into the Windy City

BY ELLIS BOOKER
CW STAFF

CHICAGO — Prodigy, the on-line information service from IBM and Sears, Roebuck and Co., came last week with high hopes of luring some of this city's estimated 375,000 households with personal computers into the information age.

Chicago is the latest city to be added to the Prodigy Services Co. network, which brought its first users on-line last October and now claims approximately 85,000 households — which may include up to six users each — as subscribers in 30 U.S. cities. Dallas and Fort Worth, Texas, are slated for this week, according to the company.

"Prodigy has added between 125,000 and 140,000 subscribers since October, and that has to be the quickest acquisition of subscribers on record," said Bernell Wright, vice-president of the electronic communications practice at Link Resources Corp. in New York.

Wright also believes Prodigy is ahead of its projections for attracting advertisers, a traditionally difficult feat for new forms of mass media.

However, Wright believes the service will need "millions" of subscribers to justify what Link estimates to have been a "$500 [million] or $600 million" investment to date. "They may have to invest up to $1 billion to make it go," he said, adding that a benchmark for the service will be whether it can "cross the million subscriber market within 18 months."

Household fad

According to Link figures, the number of households subscribing to videotex will grow from 1.3 million this year to 4.8 million by 1993. However, Link figures also show that the number of households with PCs and modems will grow from 7.1 million this year to 17.8 million by 1993 — proving that a modem does not a videotex user make.

Currently, Compuserve, Inc., an H&R Block subsidiary in Columbus, Ohio, is the nation's largest videotex provider, with around 540,000 subscribers. Prodigy officials, meanwhile, step gingerly over the bodies of such failed videotex ventures as Knight-Ridder, Inc.'s $50 million-plus Viewtron videotex service.

Among other encouraging trends, Prodigy officials cite the dropping prices of PCs, better familiarity with the PC and the thirst of baby boomers for information and services.

Pricing for Prodigy is fixed at $9.95 per month, plus local telephone connection charges. Using 1.2K bit/sec. or 2.4K bit/sec. modems, an IBM-compatible PC with 512K bytes of memory, users have access to approximately 700 information services, including electronic mail, online investing, shopping and news.

Unlike text-based on-line information services, Prodigy employs the North American Presentation Level Protocol Syntax (NAPLPS), for its graphical user interface.

While NAPLPS adds a free face to on-line service and can portray a graphical representation of the camera that the consumer is thinking about buying through the Sears' on-line catalog, the speed of the service is appreciably slower than text-based services.

However, Prodigy's architecture employs the subscriber's PC to process and store many images and thus improves response time.

Sun

FROM PAGE 49

wrapped distributed applications.

The CDCP championed by the triumvirate and 20 other backers — including Novell rivals 3Com Corp. and Banyan Systems, Inc. — is an amalgamation of several pieces: Support for Novell's RPCs and Sun's RPC library and extended data representation protocols, a Unix System 4 Transport Layer Interface co-developed by Sun and AT&T and a new release of Netwise's RPC Tool compiler, which is slated to ship early next year. A CDCP developer's tool kit will be offered in the first half of 1990.

Despite the swarm of support, the Sun platform is neither unique nor the first to be proposed. Sun's proposed RPC will compete with an RPC backed by Digital Equipment Corp. and Apollo Computer, now a division of Hewlett-Packard Co. That RPC is derived from Apollo's Network Computing System, which numbers DEC and IBM among its many licensees. Both groups have offered their respective RPCs to the Open Software Foundation (OSF) as a standard.

Neither the Sun nor Apollo/DEC RPCs compete with OS/2 LAN Manager's Named Pipes interprocess communications, according to spokesmen from Sun, Microsoft Corp. and Oracle Corp. Actually, both would-be RPCs run on top of Named Pipes, several backers of the Sun RPC proposal explained.

Supporting cast

In all, 20 developers, along with Burlington Coat, turned out to hail Sun's RPC effort as a "breakthrough." Developers such as Ashton-Tate Corp. and Oracle Corp. added their voice to Lotus', expressing enthusiasm for the would-be RPC standard.

Yet several developers indicated that they are willing to support two RPCs. As one developer pragmatically put it, "Supporting two RPCs is a lot better than supporting multiple standards."

Casting a slight pall over the announcement was the absence of IBM and Microsoft. Efforts to reach IBM for comment were unsuccessful. A somewhat cryptic Mike Murray, Microsoft's marketing director of its networking business, would only say that Microsoft's position will become clear once OSF makes its decision, which some observers say will be next month.

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NEW PRODUCTS

Local-area networking hardware

Xerox Corp. has announced the Xerox Encryption Unit, an electronic encryption device that allows government computer users to send and receive classified and unclassified messages on the same local-area network.

The product was designed to protect information transmitted over LANs that meet IEEE 802.3 and Ethernet standards, the company said. The device is installed between a workstation or a personal computer and a network connection. It measures 3 by 10 by 12 in. and can sit atop a Xerox 6085 workstation processor.

The unit sells for $4,995.

Xerox
P.O. Box 1600
Stamford, Conn. 06904
203-329-8700

Racal-Interlan, Inc. has announced the NI6510, a 16-bit Ethernet network controller targeted for performance-sensitive networks that use Novell, Inc. Netware workstations and servers.

The product reportedly includes an externally mounted switch that allows users to quickly configure the controller to run IBM Personal Computer AT-based Netware systems on thick or thin Ethernet. The product works with most AT-compatible computers based on Intel Corp.'s 80286 or 80386 microprocessor.

It costs $495 and volume discounts are available.

Racal-Interlan
155 Swanson Road
Boxboro, Mass. 01719
508-263-9929

DNA Networks, Inc. has announced two local-area network environments targeted at users with multivendor configurations.

DNA Meganet offers support for eight to 256 nodes and operates at 10M bit/sec., according to the vendor. It is said to provide Netbios compatibility and can access any printer, modem or facsimile that resides on the network.

DNA Micronet supports as many as 64 users and operates at 2M bit/sec. line speed. Both systems reportedly integrate with IBM Personal Computers and compatibles running MS-DOS 3.1 or higher.

DNA Meganet's retail pricing starts at $695 for the master board and $395 for each workstation board. DNA Micronet is priced at $345 per two-user kit.

DNA Networks
351 Phoenixville Pike
Malvern, Pa. 19355
800-999-3622

Local-area networking software

Excelan, Inc. has announced a Transmission Control Protocol/Internet Protocol networking software product for desktop computers running the OS/2 operating system.

Called LAN Workplace for OS/2, it is said to be both hardware- and media-independent and can operate over all Ethernet and Token-Ring implementations. The software resides in random-access memory and can be used with any standard personal computer networking interface controller that supports the Network Device Interface Specification standard, the company said.

The product is priced at $495 per node and is scheduled for release in the fourth quarter.

Excelan
2180 Fortune Drive
San Jose, Calif. 95131
408-473-2300

The Softbridge Group has upgraded its Bridge software integration products, reportedly designed to connect multiple off-the-shelf and custom Microsoft Corp. Windows and DOS applications under a common graphical interface of menus, icons and dialogue boxes.

Versions 1.1 of the Bridge Tool Kit, Bridge/286 and Bridge/386 are said to feature upgraded dialogue box data validation, dialogue boxes that terminate with a timer rather than a push button, a browser and trace function and a bit-map capability that permits screen captures of other applications.

The Bridge Tool Kit sells for $695, and run-time licenses of Bridge/286 and Bridge/386 start at $125 per unit. The upgrade is free and will be mailed to Bridge users.

Softbridge
125 Cambridgepark Drive
Cambridge, Mass. 02140
617-576-2257

Network management

Hewlett-Packard Co. has announced HP Glance, a performance-management software tool developed to bring on-line interactive resource monitoring to HP 3000 business computer users.

The software reportedly permits the user to monitor memory management, CPU utilization and disk I/O activity. It runs on a standard HP terminal connected to the HP 3000 system.

The product is priced from $600.

HP
3000 Hanover St.
Palo Alto, Calif. 94304
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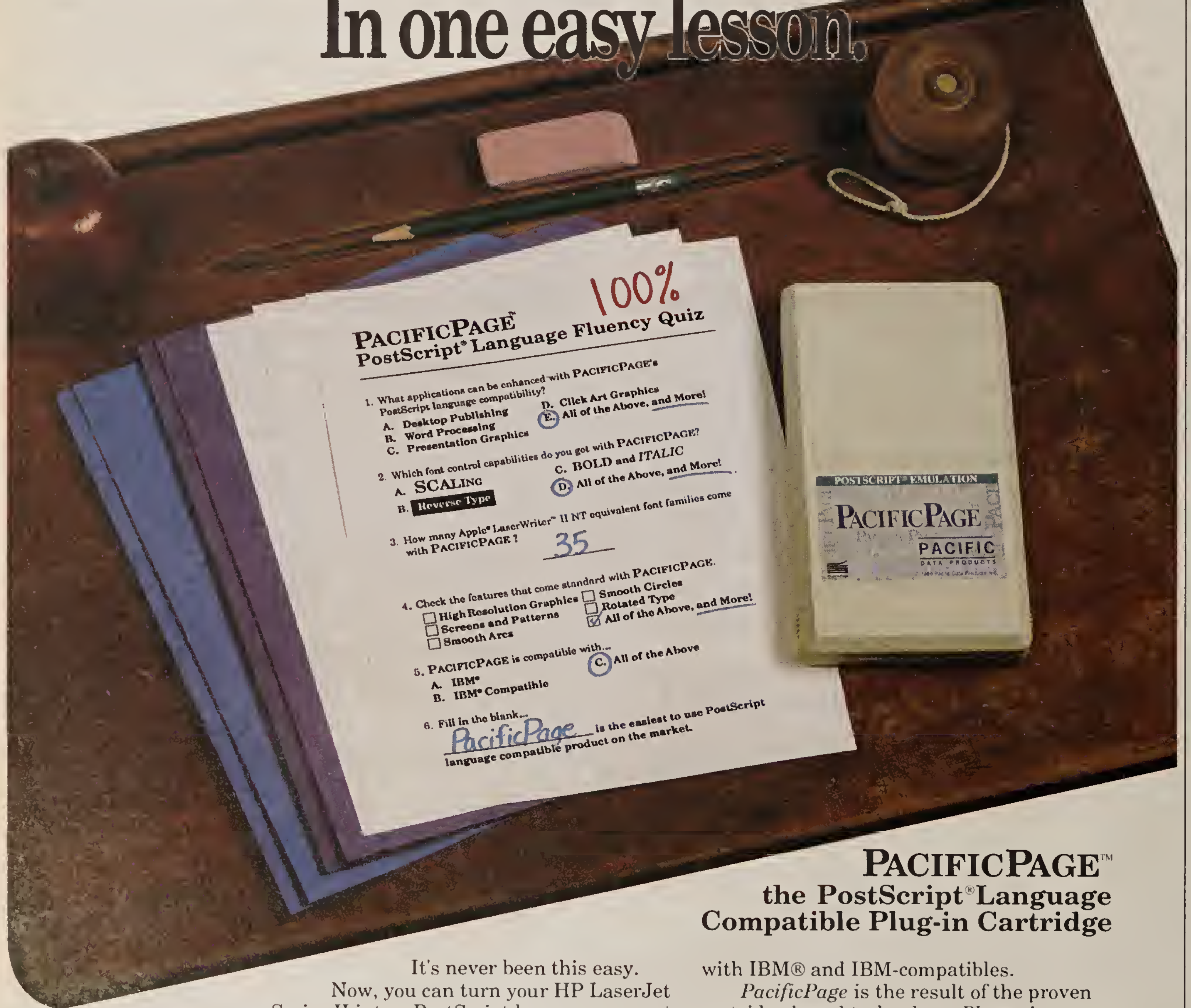

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McDATA raises network communications to a new plane of efficiency, going beyond plug-compatibility to a sophistication in connectivity which represents a value in itself, not just a workaday necessity.

For example, for bulk file transfers between hosts, the LinkMaster 6100C network processor allows files on a host to be sent quickly and effectively to not just one, but multiple hosts in multiple locations.

The 6100C network processor utilizes existing channel connections for direct NetView interface.

MC

Using the LinkMaster 5000 series of channel extenders, disaster recovery backup tapes can be made offsite whenever they are needed, eliminating the time and expense of manual tape transportation.

The 5000 series of channel extenders can be installed in less than one hour.

LinkMaster 4174 controllers interconnect 3270 terminals, ASCII terminals and PCs to multiple hosts, either DEC or IBM. And LinkMaster products enhance network management with direct NetView interface.

These are just a few highlight examples of McDATA's LinkMaster network solutions at work.

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DATA

Customer-premises equipment

Scientific-Atlanta, Inc. has announced a T1 product created to broadcast data over satellites.

The Model 4580 uses very small-aperture terminal (VSAT) technology to distribute data, video, voice and audio from a centralized facility to a widely dispersed network of remote locations, the vendor said. The device may be configured for operation up to 1.5M bit/sec. or 2M bit/sec. and can be used for either stand-alone broadcast data applications or as part of an integrated VSAT-based data communications system.

The product is priced from $3,000 to $5,000, depending on network configuration.

Scientific-Atlanta
Box 105600
1 Technology Pkwy.
Atlanta, Ga. 30348
404-441-4000

Links

Data Switch Corp. has announced a channel extender designed to enable IBM 3090 mainframes and compatible computers to communicate with direct-access storage device disks at distances up to 1,300 feet.

The Model 9390 is said to be software-transparent to both the computer and control unit channels and uses shielded twisted-pair cable to connect a pair of extender units. The product is priced at $19,800, and a monthly rental program is available.

Data Switch
1 Enterprise Drive
Shelton, Conn. 06484
203-926-1801

Electronic mail

An electronic-mail network developed for small and medium-scale businesses requiring international communications capabilities has been announced by Globalnet, Inc.

The Globalnet Electronic Mail System (GEMS) is a value-added network service for transmitting memos, newsletters and written materials worldwide. GEMS is capable of carrying binary files such as spreadsheets and databases and allows messages to be printed, resent or saved as a personal computer file. Subscribers must be equipped with a personal computer and a standard modem.

Pricing for the product varies with customer usage and configuration, with discounts available for multiple-address messages.

Globalnet
310 Madison Ave.
New York, N.Y. 10017
212-692-9880

Modems

Best Data Products, Inc. has announced Smart One 4824SF, a 2.4K bit/sec. data modem with facsimile capabilities.

The device incorporates a G3-compatible fax operating mode for transmitting graphics, ASCII files and documents from the user's IBM Personal Computer or compatible to fax-capable machines. It reportedly can transmit graphics in a bit-mapped format. It sells for less than $200.

Best Data Products
5907 Noble Ave.
Van Nuys, Calif. 91411
818-786-2884

Gateways, bridges, routers

A second-generation, full-bandwidth bridge has been announced by Cross Comm Corp.

The High Speed Bridge Ethernet-to-Ethernet bridge was designed to match the maximum traffic requirements possible on any Ethernet local-area network. It comes equipped with network management functions, Spanning Tree Protocol and IEEE 802.1 compliance. The bridge is priced at $3,850 in unit quantities.

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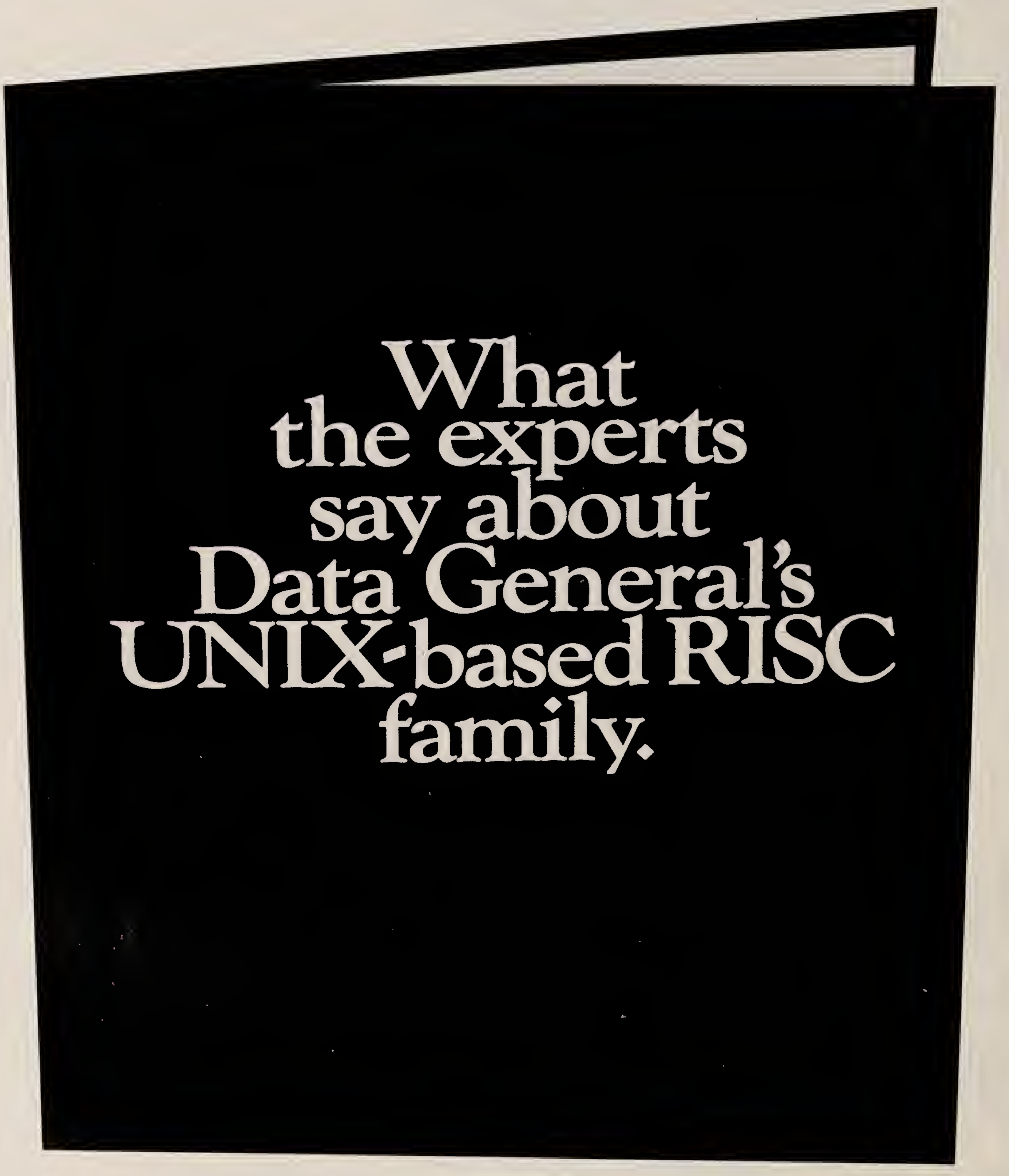
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MANAGER'S JOURNAL

EXECUTIVE TRACK

R. Mark Bentley has joined **Iron Mountain**, a Boston-based records management company, as director of management information systems. He is responsible for the design and support of all information systems and reports to Iron Mountain President Richard Reese.

Bentley was formerly MIS manager at Alpha Industries in Woburn, Mass. Before that, he was a management consultant at Grant Thornton in New York.

Bentley holds a bachelor's degree from the University of Massachusetts at Amherst and an MBA from the Wharton School of business at the University of Pennsylvania.

Iron Mountain is the U.S.' largest records management firm, storing more than 13 million cubic feet of business records.

....

Stephen Long has been named director of computer resources at **Hawthorne/Wolfe, Inc.**, a St. Louis-based communications firm. Long, who was previously the department manager for desktop services at The Composing Room in St. Louis, will be responsible for computer-aided design and typesetting at Hawthorne/Wolfe.

....

Christos Jason Moschovitis, former vice-president and chief information officer of The O'Connor Group, has founded **Christos Moschovitis & Associates.** The Brooklyn, N.Y.-based firm is an IS consulting organization focusing on strategic planning, systems integration and networking and applications development.

....

Who's on the go?

Changing jobs? Promoting an assistant? Your peers want to know who is coming and going, and *Computerworld* wants to help by mentioning any IS job changes in Executive Track. When you have news about staff changes, be sure to drop a note and photo or have your public relations department write to Clinton Wilder, Senior Editor, Management, *Computerworld*, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701-9171.

Shhh! Don't talk tech at Cadbury

Innovative technique requires developers to learn the business first

BY RICHARD PASTORE
CW STAFF

For at least a couple of months during his employment, a systems developer at Cadbury Schweppes, Inc. will be forbidden to say the words "personal computer," "mainframe" and "software." Instead, he may talk about how apples are unloaded from trucks, sorted and pressed into juice or sauce at a factory of Cadbury subsidiary Mott's USA.

That developer is conducting what Cadbury calls a business review, an innovative management technique that the world's third-largest beverage company uses to assimilate its many acquisitions with a minimum of technological hiccups.

The review — intended to identify business problem areas and then recommend technological solutions — is a concoction of Chief Information Officer Joe Nash. Nash oversees information systems for all of Cadbury Schweppes' North American subsidiaries from a ginger-ale-tinted headquarters building in Stamford, Conn.

"The people in MIS, who all have good business backgrounds as well as technical backgrounds, go into the business and review how [business managers] do their work," Nash explains. "They look at flow of information and how tasks are done. They sit down with user management and go out into the field to make customer calls with the salesmen."

At no time during the initial review can the IS staffers talk technology. "It's really taboo," Nash says. Once problem areas are identified that could benefit from some sort of automation, "only then do we allow our people to say things like 'PCs' and 'software.' "

JOYCE RAVID

Cadbury's Nash *gets IS and business staff together*

One business manager, Mott's Director of Marketing Frank DeLeo, admits he was surprised by the concept at first. But after seeing it in action, "it struck me as a very logical way of getting at our needs and how to address them," he says. "They walk in extraordinarily open-minded and without a [preconceived] solution."

Nash's staff helped identify the need to better manage Mott's marketing data and recommended a new marketing analysis system. "It was a joint project — we worked together to find the right solution," DeLeo says.

Besides Mott's, Cadbury's other major acquisitions have included Canada Dry Corp. and, most recently, Crush International. Cadbury integrates its acquisitions technically by porting its financial applications to the IBM 3081 Model K mainframe in Cadbury's Naugatuck, Conn., data center.

At the same time, Cadbury converts the acquisition's internal applications, including word processing and payroll, to standardized packages that run in

Continued on page 66

Two-in-one facility a dream come true

BY MITCH BETTS
CW STAFF

The management philosophy at MCI Communications Corp. stresses that data processing and transmission operations should be virtually seamless. In a move that makes that philosophy very concrete, MCI has opened a facility in North Royalton, Ohio, that combines a highly automated data center and a network operations center.

MCI

The combined facility is the first of its kind in the telecommunications industry, according to Frank J. Kozel Jr., MCI's senior vice-president of network construction and administration.

Allan Ditchfield, senior vice-president of MIS, says collocation reduces costs because the operations can share the facility's security, fire-suppression and environmental systems. In addition, he said, only one set of managers is needed to oversee the combined center, and construction costs are reduced.

At the newly expanded North Royalton Operations Center, the data center takes up about half of the 160,000-sq.-ft. facility. The data center has two IBM 3090 Model 600S computers — with two more to be added next year — that handle billing, order entry and order processing for MCI customers in a 14-state area. The network operations center controls switching and transmission for a large percentage of the voice, data and image traffic on MCI's network, handling more than one million calls per hour.

Kozel said the center is one of the most highly automated in the telecommunications industry. Four robotic tape-storage silos feed tapes into the computers once every 28 seconds — a process that would take between one and seven minutes to accomplish manually. Furthermore, the center is remotely controlled from MCI's National Network Management Control Center in Reston, Va.

Because the center has a combination of human managers and robots, however, Ditchfield refers to it as a "darkened" data center rather than a "lights out" data center.

Black execs 'network' at BDPA gathering

ANALYSIS

BY JEAN S. BOZMAN
CW STAFF

LOS ANGELES — The seminar topics were the usual for an information systems conference. The subjects were IBM's DB2, AT&T's Integrated Services Digital Network technology and artificial intelligence. But the audience looked distinctly different from those attending most IS meetings — nearly everyone in the audience was black.

The occasion earlier this month was the eleventh annual meeting of the Black Data Processing Associates (BDPA) conference, an event that drew 200 of the nonprofit association's 1,100 members. What drew them across the country, many traveling at their own expense?

One member put it this way: "Racism is not an excuse for not moving ahead and progressing in my chosen field," said Margaret Jennings of Washington, D.C. "And racism is not going away."

Many BDPA members said that, during careers spanning 10 to 20 years in the IS field, they have hit a "glass ceiling" preventing further promotions. BDPA was formed to help prevent the isolation of a dead-end career caused by discrimination and to provide a growth path through networking with other black IS practitioners.

The keys to networking are the members' business cards, which read like a directory of corporate America. There are members from Ford Motor Co., Electronic Data Systems Corp., MCI Communications Corp., IBM, Digital Equipment Corp. and Federal Express Corp.

BDPA membership does not connote dissatisfaction with one's job, members said. Instead, joining the group reflects an interest in sharing experiences with others who face the same challenges and obstacles. BDPA seminars include self-help and management topics.

According to its mission statement, BDPA has the following purposes: to support individuals pursuing information processing as a career or entrepreneurial opportunity; to provide a forum to develop IS-related skills; to enhance the understanding and utilization of information processing within the minority community; and to join with other IS-related organizations to support common goals.

But progress has been more on a person-to-person level than on an organizational level. Thirteen years after its founding in Philadelphia, BDPA has 34 chapters spread across the country, including large chapters in Los Angeles, Chicago, Cleveland, Detroit, New York, Philadelphia and Washington, D.C. Despite the many locations, it has only 1,100 members. Growth has been hampered by its all-volunteer organization and lack of an executive director and official headquarters, BDPA organizers acknowledged.

Even if it had 2,000 members, BDPA would be far smaller than the 40,000-member Data Processing Management Association. But Chet Holmes, program chair for the Los Angeles BDPA convention, did not rule out national membership of 5,000 or more by the early 1990s. A survey by the Los Angeles chapter, which has 100 members, indicated that there is a potential audience of 15,000 black IS professionals within 50 miles of downtown Los Angeles, Holmes said.

BDPA President Vivian C. Wilson, an Ohio Bell operations manager in Cleveland, said there will be a national push this year for new members. "Our agenda is to promote and to publicize," she said. "By this time next year, I would like to have 2,000 members who are intensely involved in the DP field."

To encourage young people to enter the DP field, the BDPA sponsors an annual computer competition involving high-school-age teams. This year, there were 40 contestants from eight cities, the seven listed above plus Memphis.

The competition, held Sept. 15, used queuing theory to analyze how quickly people were served at a retail store. Teams had to create a Basic program within three hours. The prize was a $1,000 scholarship for each member of the winning team, in this case, New York.

"RACISM IS not an excuse for not moving ahead and progressing in my chosen field."

MARGARET JENNINGS
BDPA MEMBER

The high-school competition reflects the BDPA's philosophy that further integration of the computer field will be accomplished not by leaps and bounds but by small steps. The contest touched hundreds more students who competed within each city that fielded a team.

The goal, said BDPA educational chair Jesse L. Bemley, is to encourage black students to view IS as an area in which they can achieve. "These young people get a chance to see that there are black professionals in information processing," said Bemley, who is information manager of the U.S. Army's Cost and Economic Analysis Center in Washington, D.C. "It's an identification process that we hope will show them they do have a place in the DP field."

Cadbury

FROM PAGE 65

IBM mainframe MVS and Personal Computer environments. But in many cases, standard packages are not appropriate, and operations may not even be automated. That is where the business review comes in.

An IS-led business review is not unique as a concept, but it is innovative in practice. "While a lot of companies give that approach lip service, our experience is that not as many people actually do it," observes Joe Donia, a Coopers & Lybrand consultant who conducts such reviews for clients.

For many of the staff, the review approach required attitude adjustments. "It was a bit difficult at first because MIS people traditionally go in with a technology idea and say, 'Oh, I can do these wonderful things,' without understanding the fundamentals of the business," he says. But the staff quickly warmed up to the task, Nash says.

Cadbury's first business review arose from a frustrating systems-planning discussion that took place two years ago between Nash and executives of the company's Schweppes unit. Nash called a halt to the talks and suggested starting over by taking a good look at the business operations.

"We sent people out there for two months," Nash recalls. "They went out in the field, made calls on bottlers." Upon return, they identified specific problem areas, including a weakness in sales force productivity — something the Schweppes president later admitted always concerned him, Nash says.

The suggested IS solution was to arm the sales force with laptop computers. It began by involving seven salespeople, and since then, the entire national sales force has adopted the laptops. The result after a year has been a 20% rise in productivity.

"It worked out terrific: They were making more bottler calls instead of doing all this administrative paperwork," Nash says. The salespeople use the machines to do presentations to bottlers, using packages such as Software Publishing, Inc.'s Harvard graphics.

At the latest national sales meeting, according to Nash, most of the sales team hooked their PCs to overhead screens to run their meeting presentations. And they were wearing "I love my laptop" buttons.

CALENDAR

The National Institute of Standards and Technology and the National Computer Security Center will host the 12th National Computer Security Conference Oct. 10-13 in Baltimore. The conference, titled "Information Systems Security: Solutions for Today — Concepts for Tomorrow," will focus on security issues challenging the user community, vendors, systems developers and administrators.

For the first time, there will be a track accommodating the subjects of computer security education and ethics, which will include sessions on computer security awareness training for both the employee and the executive, computer misuse and abuse, ethics in the workplace and the question of management responsibility vs. individual rights.

For more information, contact the 12th National Computer Security Conference, Office of the Comptroller, National Institute of Standards and Technology, A807, Administration Building, Gaithersburg, Md. 20899.

OCT. 1-6

Adapso's Management Conference. Orlando, Fla., Oct. 1-4 — Contact: Frances Ianacone, Adapso, 1300 North Seventeeth St., Suite 300, Arlington, Va. 22209-3899.

Computer Services Seminar and Communications & Information Systems Seminar. Baltimore, Oct. 1-4 — Contact: Rivka Hawk, Alex Brown & Sons, 135 E. Baltimore St., Baltimore, Md. 21202.

Guide International Symposium, "Information Systems Perspectives: Affecting the Global Market." San Francisco, Oct. 1-4 — Contact: Guide, Suite 600, 111 E. Wacker Drive, Chicago, Ill. 60601.

Oracle 1989 International User Week. Dallas, Oct. 1-6 — Contact: Oracle, 20 Davis Drive, Belmont, Calif. 94002.

CD-ROM Expo. Washington D.C., Oct. 2-6 — Contact: IDG Conference Management Group, P.O. Box 9171, 20 Speen St., Framingham, Mass. 01701-9171.

Communications Systems Technical Conference. Washington, D.C., Oct. 2-5 — Contact: IBM, Communications Conference Coordinator, Third Floor, 1745 Jefferson Davis Hwy., Arlington, Va. 22202.

Computer Facility Planning and Operations. Los Angeles, Oct. 2-3 — Contact: Education Extension, Georgia Institute Of Technology, Atlanta, Ga. 30332.

Electronic Imaging Conference East. Boston, Oct. 2-5 — Contact: MG Expositions Group, 1050 Commonwealth Ave., Boston, Mass. 02215.

Electronic Industries Association Conference. Los Angeles, Oct. 2-5 — Contact: Electronic Industries Association, 2001 I St. N.W., Washington, D.C. 20006.

Europe 1992, How Will It Affect Your Business? New Orleans, Oct. 2-4 — Contact: Computer Aided Manufacturing International, Inc., Suite 500, 1250 E. Copeland Road, Arlington, Texas 76011.

IBM Education Communications Systems Technical Conference. Washington, Oct. 2-5 — Contact: IBM, Communications Conference Coordinator, 3rd Floor, 1745 Jefferson Davis Hwy., Arlington, Va. 22202.

The National Communications Forum. Chicago, Oct. 2-4 — Contact: Professional Educational International, Suite 740, 303 East Wacker Drive, Chicago, Ill. 60601.

Service Level Management Seminar. Los Angeles, Oct. 2-4 — Contact: The Institute for Information Management, Inc., P.O. Box 361556, Milpitas, Calif. 95035.

Use of Artificial Intelligence in Manufacturing Applications. Santa Clara, Calif., Oct. 2 — Contact: Techmart, 5201 Great America Pkwy., Santa Clara, Calif.

Cost Effective Cooling for Electronic Equipment course. Milwaukee, Oct. 3-6 — Contact: University of Wisconsin, Center for Continuing Engineering Education, 929 North Sixth St., Milwaukee, Wisc., 53203.

Electronic Imaging East. Boston, Oct. 3-5 — Contact: MG Expositions Group, 1050 Commonwealth Ave., Boston, Mass. 02215.

ITUCOM '89 World Electronic Media Symposium and Exhibition. Geneva, Oct. 3-8 — International Telecommunications Union (ITU), ITU-COM 89 Secretariat, International Telecommunication Union, Place des Nations CH-1211 Geneve 20, Switzerland.

1990 Business Outlook Conference. New York, Oct. 4 — Contact: The Conference Board, Inc., P.O. Box 4026 Church Street Station, New York, N.Y. 10261-4026.

Open Systems Conference. San Francisco, Oct. 3-5 — Contact: Exoconsul International, Inc., 3 Independence Way, Princeton, N.J. 08540

PC Expo. Chicago, Oct. 3-5 — Contact: PC Expo, 385 Sylvan Ave., Englewood Cliffs, N.J. 07632

Electronic Messaging. Chicago, Oct. 5-6 — Contact: Electronic Mail Association, Suite 555, 1555 Wilson Blvd., Arlington, Va. 22209.

OCTOBER 8-13

Techtron '89, an annual conference of Wang users. Boston, Oct. 8-11 — Contact: United States Society of Wang Users, Suite 206, 2138 South 61st St., Chicago, Ill. 60650.

North American ISDN Users' Forum. Phoenix, Oct. 9-12 — Contact: ISDN Users Forum, NIST - NIU Forum Adminstrator, Room B364, Bldg. 223, Gaithersburg, Md. 20899.

Communications Systems Technical Conference. San Francisco, Oct. 10-13 — Contact: IBM, Communications Conference Coordinator, Third Floor, 1745 Jefferson Davis Hwy., Arlington, Va. 22202.

Computer Security Conference: Solutions for Today, Concepts for Tomorrow. Baltimore, Oct. 10-13 — Contact: Irene Gilbert, NIST, A254 Technology Bldg., Gaithersburg, Md. 20899.

TAKING CHARGE

Clinton Wilder

The business culture dilemma

Bridging the cultural gap between the information systems department and the world of line managers and business executives is probably *the* critical success factor for any firm's IS today. Reams have been written and millions of consulting dollars spent on the subject, but it seems to me the gap stems from a fairly simple dichotomy.

The world of the IS professional, the technologist, is one of certainty. The very nature of digital computing makes it such. Machine language is either a binary 1 or a 0; the gate on the semiconductor chip is either open or closed. And the result of the technology — data — means facts and figures that are tangible, hard and finite.

But the world of the businessman, particularly in 1989, is a confusing cacophony of fear, uncertainty and doubt that not even the most aggressive IBM account control salesman of the 1970s could have dreamed up.

At the Enterprise-Wide Information Management (EWIM) Conference in St. Louis earlier this month, Gartner Group consultant Bruce Rogow asked the crowd of about 300 to raise their hands if their company had kept the same top management and strategy for the past three years. Maybe a dozen hands went up.

Management transition and turnover is just the tip of the iceberg. Today's business executive is like the Binkley character in the *Bloom County* comic strip who lies awake at night wondering what ogre is lurking in the bedroom closet that houses his worst fears. The corporate takeover beast is certainly in there, but he shares the closet space with Japan, Inc., Fortress Europe, fickle customers, potential shareholder lawsuits and recession worries.

It wasn't always this way. In the postwar economic boom that embraced the Alfred Sloan philosophy of management and the still-prevalent U.S. corporate culture, concepts such as low-cost production and economies of scale virtually guaranteed business success. Demand was steady, foreign competition was nonexistent, and the corporate engines of America required little more than regular oil changes to keep churning out profits.

The data processing manager, who supplied the oil, thought his life was pretty certain, too. Lifetime employment was all but promised to the DP manager who followed two simple rules: Don't screw up and don't go over budget.

Those days are long gone in any remotely progressive corporation, but the cultural dichotomy between the certainty of the technologist and the uncertainty of the business world remains.

Let's take a hypothetical example. An auto parts manufacturer asks its IS department for an on-line order entry system for its valve division. The system is developed and delivered on time (let's say in a year), on budget, and meets all the user specs. But because of changing business conditions, it is virtually useless — the IS equivalent of "The operation was successful, but the patient died." During the year of development, suppose any one of the following occurred:

- The division is put on the selling block because the parent firm has been advised by its chief financial officer that its stock is undervalued and it is prime fodder for an asset player's raid.
- A Korean firm blindsides the market with a new valve priced 50% below most U.S. companies' quotes, and management is considering exiting the business.
- The newly hired division vice-president decides to completely restructure the sales function in a way that makes this order entry system irrelevant.

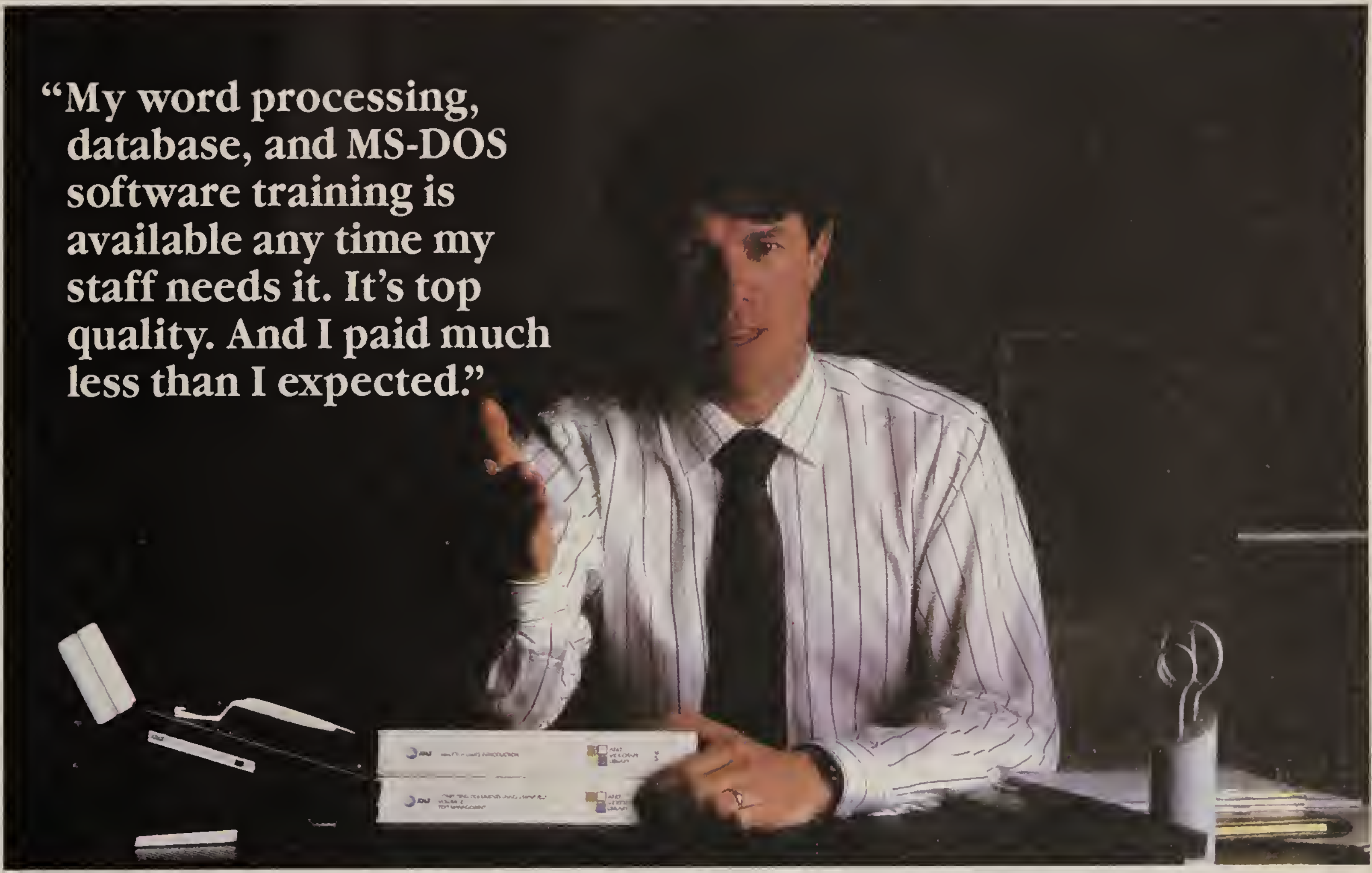
More than ever, the rules of the business game are such that access to accurate, timely information is only the starting point for making the right move. "The top guns don't really deal with hard data," said Don Winski, Warner Communications' executive director of corporate IS, at the EWIM conference. "Decisions are based more on personal relationships and deal making." And one top executive, Mission Land President Robert Umbaugh, said, "It's impossible for me to say what information I need until I need it."

So even as information proliferates throughout a company, it does not translate into strategic advantage or increased productivity because today's business world is so unstable and uncertain.

What's the answer? The same one you've heard many times before: communicate, communicate and communicate. The only way the IS professional from the world of technology certainty can cross the line to the business domain is by constant interaction and exchange.

The IS executive must realize the uncertainty, become conversant with the fears that keep the chief executive officer or manufacturing VP awake at night and understand that the success of data and technology are constantly threatened by the business ogres in Binkley's closet.

Wilder is *Computerworld*'s senior editor, management.



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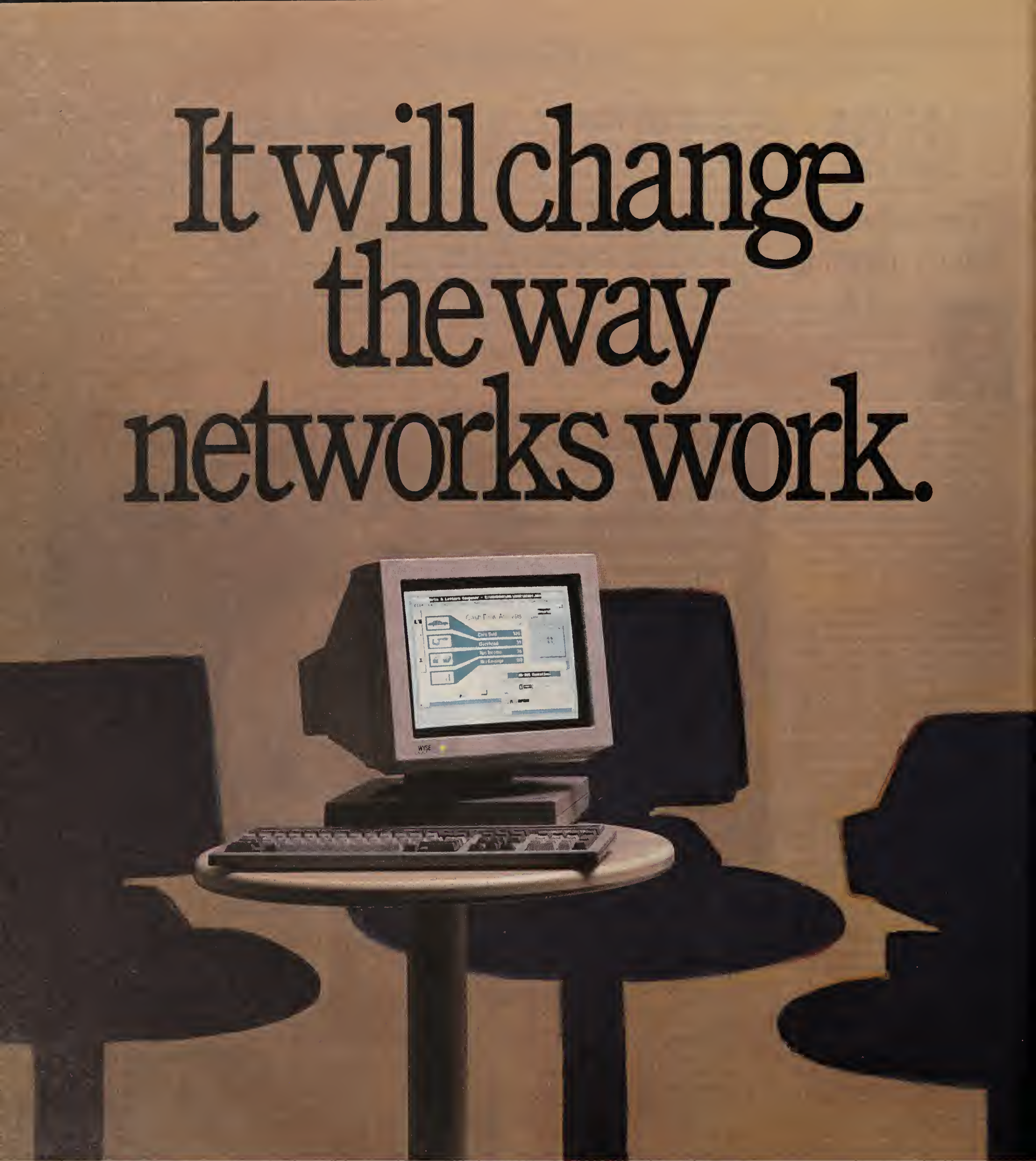

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WYSE

HARDWARE ROUNDUP

PCs, WORKSTATIONS AND SMALL SYSTEMS

More PC players, but fewer innovators

BY JOHN J. XENAKIS

While last year's changes in the personal computer world were evolutionary, not revolutionary, the major news flash would seem to be IBM's loss of market share. According to La Jolla, Calif.-based Computer Intelligence, IBM's percent of market share for units sold into the Fortune 1,000 slipped from 72% to 64% between 1988 and 1989. The slack was picked up by its competition, including Compaq Computer Corp. and Apple Computer, Inc.

The decrease in IBM's market penetration is only a small part of the story, however. One clue to the bigger picture is that, for IBM, sales are up, even though its share is down, according to San Jose, Calif.-based Dataquest, Inc. estimates.

What is really happening here is a broadening of the PC market into one where the micro is just a commodity. While IBM may sell more units, other vendors are also building an installed base, thus reducing IBM's share. The industry has been edging in this direction for some time, but last year was a watershed, with panies steering away from pure brand loyalty.

IBM has felt some effects from this dilution, but the biggest impact has been felt in the the so-called middle tier of clone makers, where many vendors have simply washed away, and in the bottom tier, where little but price matters anymore.

It was only two years ago that there were three well-established tiers of IBM Personal Computer-compatible manufacturers. The top level — IBM, Compaq, AT&T, ITT Corp., Zenith Data Systems and a few others — spent a great deal of development dollars to be on the leading edge of technology. Fortune 500 companies bought almost exclusively from these companies, and brand loyalty was high. This loyalty is still high but not as unshakeable.

RON CHAN

The middle tier — including Dell Computer Corp., Leading Edge Hardware Products, Inc. and AST Research, Inc. — took the latest IBM hardware and added a few bells and whistles to make it more competitive at a lower price than IBM's.

PERSONAL COMPUTERS

But brand loyalty in the upper tier and competitive pricing in the bottom tier washed out much of the price differentiation in the middle. Packard Bell Electronics, Inc. and Leading Edge were the primary examples of this; the bankruptcy of Leading Edge last February exemplifies, perhaps more than anything else, the continuing demise of this tier.

The bottom tier contains just a few companies that provide the least expensive clones, with almost no original engineering.

Today, almost anyone can build an IBM PC clone in his basement or garage. Many suppliers have sprung up to cater to that business, providing a variety of components and packaging. Buying in quantity can reduce manufacturing costs to slightly more than $100 for an entire entry-level system.

Thus, the cost to enter the PC-compatible market is extremely low, and many firms have taken advantage of that fact to seek out a slice of the market. With current technology, these clones are basically compatible with top-tier DOS systems. In that sense, PCs are as much of a commodity item as stereos. Indeed, the bottom tier's low prices have forced the middle tier to drop prices to the point at which, for the most part, the products are indistinguishable.

"Competitive pressure is causing companies to operate on

INSIDE

Testing the Waters
Laptops move out of their corner and into the mainstream. Page 74.

Changing Players
Mergers and new rivals shake workstation market. Page 83.

Big Three
In small systems, all roads lead to IBM, DEC and Unix. Page 91.

Xenakis is a free-lance writer and media commentator on the computer industry.

PC players

FROM PREVIOUS PAGE

decreasing gross margins," notes Bill Lempesis, a senior industry analyst at Dataquest. "That's putting pressure on a lot of IBM clone makers."

This pressure has made life difficult for established companies, particularly in the middle tier. For example, in August, Tandon Corp. announced price cuts, reduced its computer line and trimmed its staff by 20%. Wyse Technologies also cut its prices by 12% following three quarters' worth of losses.

Even the top tier was not immune. In late August, Compaq announced cuts of $300 to $1,300 for its Deskpro 386/25 and 386/20E product lines.

Chip influence

One factor in the melding of the market has been influences from the microprocessor arena. Price cuts for the Intel Corp. 80386SX chip in the early part of the year led many vendors to introduce lower priced systems, a move that may have factored in the recent price drops for 386 machines in general.

Intel's announcement of its 80486 chip also played a part. The chip, touted for its speed and reverse compatibility, was well received by vendors, 18 of which quickly announced intentions to provide a 486 machine.

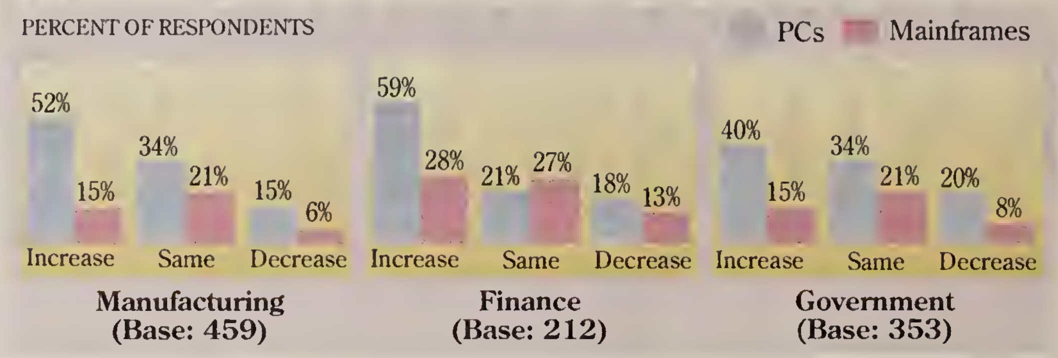
However, the 486 marketplace has been slow to develop. In June, UK-based Apricot Computers and Acer Technologies Corp., a Taiwanese vendor, were the first to announce 486-based systems, with delivery for both slated for the last quarter of this year. The first actual shipments of 486-based machines were made Aug. 18 by UK-based HM Systems. A number of new 486 models are expected to be shipped in time for Comdex/Fall '89.

The first U.S. 486 announcement came from IBM but not in the form of a complete 486 system. In June, IBM announced an add-in board that is said to convert its 386-based Personal System/2 Model 70 into a 486 machine. In July, AST Research and Advanced Logic Research also announced similar add-in boards for their own computers.

There are apparently technical reasons for taking a board-level approach. According to International Resource Development's President Kenneth Bosomworth, vendors "are finding the high speed of the 486 brings some of its radio emissions up to a frequency and amplitude that present problems."

The more things change . . .

A majority of organizations say their PC expenditures for 1989 will increase; few see their mainframe expenditures doing the same



SOURCE: SIERRA GROUP

CW CHART: DOREEN DAHLE

Adding the 486 on a separate board, which need not be certified by the Federal Communications Commission, allows a vendor to bypass the problem, Bosomworth adds.

How much of an effect the 486 will have on the market as a whole remains to be seen. Chances are that its cost — $950 each in quantities of 1,000 — could be a damper in a market in which price, not performance, is a critical purchasing criterion.

The current territorial struggle between IBM's 2½-year-old Micro Channel Architecture (MCA) and the not-yet-available alternative Extended Industry Standard Architecture (EISA) is one more way in which vendors are seeking to differentiate themselves.

In February, IBM put full its weight behind MCA, partially in reaction to the EISA counterrevolution spawned by the so-called "Gang of Nine," which includes Compaq and Hewlett Packard Co.

The MCA/EISA battle spilled over into the retail arena when David Norman, president of Businessland, Inc., the nation's largest computer retail chain, announced Feb. 2 that his organization will not be selling EISA machines. "There are three million Micro Channel computers out there," Norman says. "With [add-in] boards now available, there is no question that it will be the industry standard."

Businessland's left hook brought a swift response from Compaq, which less than three weeks later announced that it would no longer permit Businessland to sell Compaq PCs. Businessland has admitted that this termination hurt them and has not yet announced a replacement vendor.

There is little doubt that more blood will be spilled over this emotional battle. EISA will undoubtedly become an important industry product, but it is 2½ years behind MCA and has yet to get off the ground.

Perhaps more important, while MCA is encouraging brand loyalty among IBM shops, it is hard to see how EISA will do the same for Compaq. The Compaq/Businessland split only emphasizes to users the interchangeability of PCs and encourages them to seek low-cost alternatives.

Perhaps Compaq realized this

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- Outline of how long your system has been deployed, development costs including labor, and the length of time to transfer the system successfully into the field.

Please indicate two keywords describing the domain of application and the innovative AI technology. We encourage successful authors to present their results using some audio-visual medium such as videotape or live computer projection. Selected applicants will receive the Annual Innovative Application Award and will be highlighted in the AI Magazine. AAAI Press also published the results of the conference into a book, *Innovative Applications of Artificial Intelligence.*

▶ Deadline Dates

Submission of paper to AAAI office:
December 12, 1989
Program Committee Meeting
January 13, 1990
Notification to authors:
January 19 1990
Return of Revised, Final Paper to AAAI office:
March 2, 1990

Send 5 copies of your paper to:
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when, in July, it announced a cross-licensing agreement with IBM that gives it access to all of IBM's patents before 1993. The agreement, which includes MCA and other technologies, is seen by analysts to be Compaq's way of covering its bases, despite Compaq's denials to the contrary.

Almost, but not quite

Apple's Macintosh continues to be slowly accepted in the business marketplace. According to Dataquest, the Mac's market share in Fortune 1,000 companies has grown in the last year from 4% to 6%. However, the Mac seems almost at a standstill in comparison with the PC. While the PC and compatible marketplace continues to expand, Apple's continuing stranglehold on development alternatives has kept would-be Mac cloners at bay.

A couple of vendors have managed to get past the fortress of Mac individuality. Last spring, Salt Lake City-based Powder Blue Computers and Taiwanese Akkord Technology announced lower priced Mac clones. The companies skirted Apple's basic copyright by obtaining Mac read-only memory BIOS chips from third-party service organizations.

Apple's strategy of trying to maintain its individuality has backfired in another sense. Its well-known but unsuccessful copyright violations lawsuit against Microsoft Corp. and HP has caused industry resentment, as indicated by one analyst's statement that people are learning "to love the Mac but hate Apple."

The company's pricing policies have not helped, either. "The Mac was getting to the point where it might be an acceptable machine to the Fortune market, [and then] Apple raised the prices," says Jim Hammons, manager of Technology Advisory Services at The Sierra Group, Inc. As he points out, "If Apple raises its prices and your standard is Apple, you pay the new price. But in the PC market, you can go to Compaq if IBM raises prices."

The result is a major problem for Apple, which was acknowledged by company President John Sculley in a February interview. "What we have found in talking to large installations of . . . Macintoshes," he says, " is that they're not ready to put $5,000 to $10,000 computers on everybody's desk."

Sculley's statement came after a late-1988 round of price hikes for most of the Apple products, including a 29% increase for the top-of-the-line Macintosh II. Even the Macintosh IICX, a smaller version introduced in mid-March, entered the market with a bottom-line price tag of $4,699.

Apple blamed the price increases on the high cost of memory resulting from the 1988 to '89 chip shortage. However, prices of PCs and compatibles, also faced with the same shortage, have dropped during this same time, clearly pricing the Macintosh out of the league.

Bosomworth says his company learned from personal experience of the large gap between the Mac and the clones.

"'The Macs in the configurations we wanted were getting to be $5,000 to $6,000 each," he says, "while the no-name 386 clones with the equivalent configuration were coming in at $2,500 to $2,600. I think Apple's out on a rather difficult limb."

While Sculley indicated that a $1,000 Mac was under development, no word of the existence of such a machine has yet surfaced.

In that sense, Apple is very much on the same wavelength as the rest of the PC market, where rumors, expectations and intimations of IBM slippage have provided more drama than actual developments this year. Until user requirements change dramatically, the governing reality in the IBM and compatible sector will be status quo for the big names and shrinking margins for everyone else. ●

Micro monthly

October: Hitachi is the first Japanese firm to license the Micro Channel Architecture from IBM.

January: Apple introduces the Macintosh SE/30.

February: Businessland announces it will not sell Extended Industry Standard Architecture-based PCs. Compaq responds by refusing to allow Businessland to sell any of its PCs. EISA specifications are distributed to manufacturers. Leading Edge Hardware Products declares bankruptcy.

March: Grid Systems announces an MCA clone. Akkord, a Taiwanese firm, announces the first true Macintosh clone.

April: Intel announces the 80486 and 33-MHz 80386 chips. Powder Blue Computers ships a Mac clone.

June: Apricot Systems and Acer Technologies announce the first 486-based PCs. IBM announces 486 add-in board.

July: IBM, Compaq sign cross-licensing agreement. Intel demonstrates the first EISA chip set.

August: Compaq announces price reductions on its Deskpro 386/25 and 386/20E product lines.

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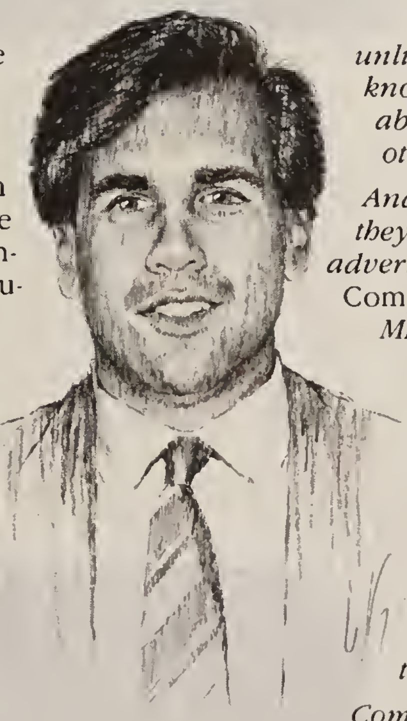

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1 The NeXT™ Computer System is the first computer in the world (and so far the only) to use read/write/erasable optical storage. While PCs today are typically equipped with Winchester drives that store 20 to 40 MB, a single optical disk can store 256 MB. Plus, it is removable, for portability and added security. This dramatically new technology provides storage that is simultaneously vast, reliable and cost-effective —a combination unmatched by computers of any size.

2 NeXT has made the power of UNIX® usable by mere mortals. UNIX is the high-performance operating system used by workstations to achieve true multitasking and superior networking. Unfortunately, it has always been the antithesis of user-friendly. NeXT has given UNIX a revolutionary new interface—one that is both visual and intuitive. Now computer users of every level can instantly wield this tremendous power, with no technical knowledge whatsoever.

3 To achieve the power needed for the 90s, NeXT bypassed traditional workstation architecture and went directly to that of a mainframe. This eliminates bottlenecks and attains an extraordinary level of system "throughput"—the true measure of computer performance. Only through the use of VLSI (Very Large Scale Integration) technology could this architecture be reduced in size so that it could fit inside a desktop computer. It's a mainframe on two chips.

4 While PostScript® has long been the industry standard for printing, NeXT has made it fast enough to also be used on the display. This "unified imaging model" ensures that what you see on the display is precisely what you will get on paper. All your work, in any size type and any degree of rotation or magnification, appears with perfect 92-dots-per-inch clarity on the NeXT MegaPixel Display. And with laser precision at 400 dpi on the NeXT Laser Printer.

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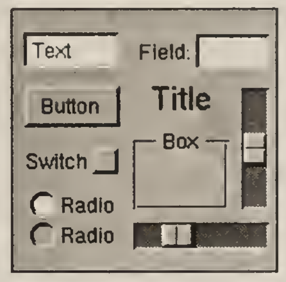
5 The NeXT Computer System is the first to be capable of producing CD-quality sound. Without requiring any additional equipment. This feat is made possible by a chip that has been specifically designed for the task of manipulating sound–the Digital Signal Processor (DSP). Because this processor is standard in every NeXT machine, software developers will be able to call upon its power to enrich programs we use every day. Now computers will not just be seen, but heard.

6 NeXT Mail takes electronic communications beyond anything you've seen on a personal computer before. Now you can send and receive multimedia mail–including text (with varied type fonts, styles and sizes), graphics and voice messages. And despite its high level of sophistication, NeXT Mail is so intuitive, you may not ever need to open the manual. NeXT Mail is built into the system, along with Ethernet and TCP/IP, so the NeXT machine can quickly become a part of existing networks.

7 Programmers can create software on the NeXT Computer up to ten times faster than on any other computer–the result of a breakthrough called NextStep.® It gives software developers the power to create the graphical user interface portion of their applications (often the most time-consuming and difficult part) without any programming at all. This revolutionary environment means we will see more programs, and better ones, in less time than ever possible before.



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Mainstreaming the laptop

BY RICHARD PASTORE

If laptop computers have been merely high-priced niche players during the past five years, then the last 12 months have seen them move away from the industry periphery and wade out into the business mainstream.

"Last year, a lot of things came together so that the overall quality of the products improved and more buyers were drawn into the market," says Bruce Stephen, an analyst at Framingham, Mass.-based market research firm International Data Corp. (IDC).

One of the most important recent developments for the sector was that Compaq Computer Corp. finally decided to take the plunge.

Before the rollout of Compaq's best-selling SLT/286 portable machine last October, "the sector really suffered from not having a major brand leader in it," according to Dick Shaffer, editor and publisher of the "Technologic Computer Letter."

Analysts have noted that technical advances have also contributed to the rapid mainstreaming of the laptop. Faster microprocessors such as the Intel Corp. 80286, hard disks and more readable screens have all become second nature for the machine. Innovations and technologies such as "notebook" configurations, Intel Corp. 80386 engines and machines with no moving parts have gained a toehold.

The advent of the notebook-size portable has been greeted with acclaim. "We're finally beginning to step over the line to real machines that fit in a briefcase and leave room for something else," Shaffer says.

NEC Corp.'s 4.4-pound Ultralite portable broke ground in the category, which has been further cultivated by Zenith Data Systems' first notebook computer. The Zenith Minisport, unveiled this summer, is about the size of an inch-thick stack of paper, weighs six pounds and costs less than $2,000.

Two-inch floppy disk drives and silicon "memory cards" help make notebook computers possible. "The memory card looks like a credit card and allows for great reduction in battery demand because there's no spinning motor," Shaffer explains.

The Ultralite and Minisport are not expected to have the niche to themselves for long, however. "We'll see most major players come out with something notebook-sized or under," Stephen predicts.

It don't come cheaply

This nifty technology is not inexpensive. "Portables are 20% to 50% more expensive than comparable desktop machines," Shaffer says. So for now, the target users for all types of portables will remain those people who absolutely need portability, such as field-service professionals.

> FASTER microprocessors such as the Intel Corp. 80286, hard disks and more readable screens have all become second nature for the laptop. Innovations such as "notebook" configurations have gained a toehold.

However, even that market contains vast untapped potential. More than 1.2 million IBM-compatible portable machines have been sold in the U.S., but there are still six million to seven million mobile field-service professionals who are prime prospects for a product that is small enough to be easily carried and stowed, according to Stephen.

There is no question that portables are making inroads. IDC estimates that unit shipments for the sector by the end of the calendar year will total 850,000, a 32% hike over last year's total. Natick, Mass.-based market research firm Venture Development Corp. expects the market to grow an average of 34% annually through 1993.

Still a gap

Although this progress is impressive, it is still a far cry from the sweep that some industry insiders predicted. Laptops will not topple desktop boxes any time soon, Stephen says. "There's still a fairly significant price gulf between portables and desktops," he says. "A 286-based portable sells for an average $3,500, while a 286-based desktop machine costs $1,500 on the street." Also, he adds, the fact that prices are dropping for 386-based desktop models makes the idea of an upset even less likely.

Meanwhile, laptop vendors are forging ahead with new technologies and innovations. Agilis Corp., for example, is making a concerted effort in "handheld, modular workstations" linked by wireless local-area networks.

The Mountain View, Calif.-based

Continued on page 82

Pastore is a *Computerworld* staff writer.

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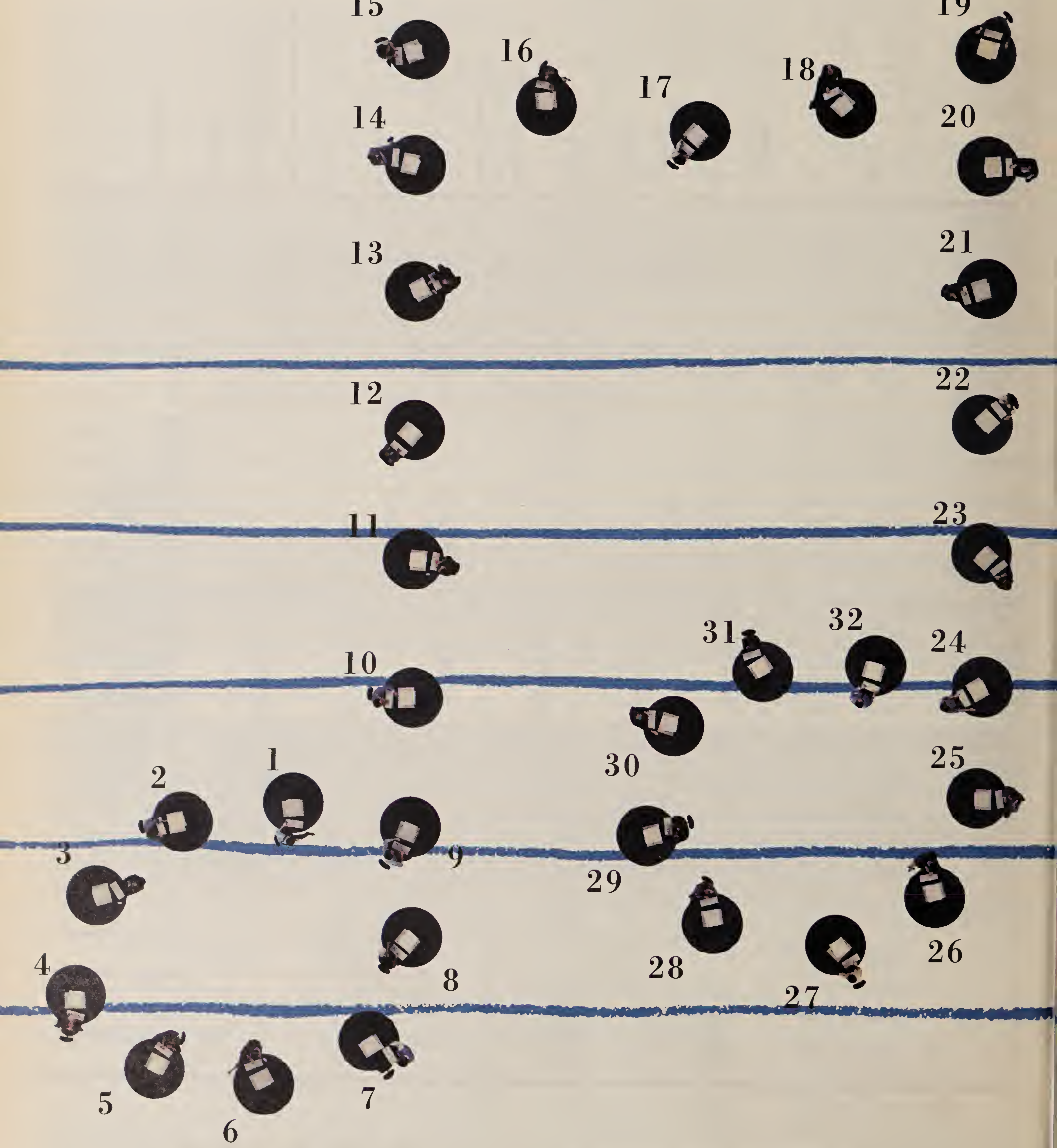
Personal computers: 80286 and higher

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DESKTOP OR PORTABLE	FOOTPRINT (inches)	OS/2 SUPPORT	VERSION OF OS/2 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Acer America **(408) 922-0333**	Acer 900/12	80286	12	DOS	2-16	1.2	Six 16-bit, two 8-bit	2	1	Desktop	21 x 16.4 x 6.5	Yes	Yes	None	AT	Dealer, third parties	$2,445
	Acer 912	80286	12	DOS	512K-1M	1.2-40	Six 16-bit, two 8-bit	2	1	Desktop	16.2 x 15.8 x 5.9	Yes	Yes	None	AT	Dealer, third parties	$1,695
	Acer 915	80286	12	DOS	512K-16M	1.2	Four 16-bit	1	1	Desktop	14.2 x 16.2 x 5	Yes	Yes	NP	AT	Dealer, third parties	$1,645
	Acer 1100/33	80386	33	DOS	4-24	1.2	One 32-bit, five 16-bit, one 8-bit, one 32-/16-bit	2	1	Desktop	20.9 x 16.5 x 6.3	NP	NP	None	AT	Dealer, third parties	$7,895
	Acer 1100/25	80386	25	DOS	2-24	1.2-24	Two 32-bit, five AT, one XT	2	1	Desktop	20.9 x 16.5 x 6.3	Yes	Yes	None	AT	Dealer, third parties	$5,395
	Acer 1030	8086	9.6	DOS	640K	360K-20M	Four 8-bit	1	1	Desktop	14.1 x 16.1 x 5	No	NP	NP	XT	Dealer, third parties	$1,045
Advanced Logic Research, Inc. **(800) 444-4257**	Flex Cache 33/386Z	80386	33	DOS, OS/2, Unix, Xenix	1-15	120	One 32-bit, five 16-bit, one 8-bit	1	1	Desktop	NP	Yes	NP	NP	AT	NP	$3,995-$9,595
	Flex Cache 25386Z	80386	25	DOS, OS/2, Unix, Xenix	1-16	120	One 32/16-bit, five 16-bit, one 8-bit	1	1	Desktop	NP	Yes	NP	NP	AT	NP	$3,495-$7,495
	Flex Cache 25386DT	80386	25	DOS, OS/2, Unix, Xenix	1-16	120	One 32-bit, six 16-bit, one 8-bit	1	1	Desktop	NP	Yes	NP	NP	AT	NP	$3,495-$5,495
	Flex Cache 20386DT	80386	20	DOS, OS/2, Unix, Xenix	1-15	120	One 32-bit, six 16-bit, one 8-bit	1	1	Desktop	NP	Yes	NP	NP	AT	NP	$2,695-$4,695
	Flex Cache SX386Z	80386SX	16	DOS, OS/2, Unix, Xenix	512K-16M	40	One 8-bit, four 16-bit	1	1	Desktop	NP	Yes	NP	NP	AT	NP	$1,795-$4,199
	ALR 386/220	80386	20	DOS, OS/2, Unix, Xenix	1-10	66	Two 32-bit, four 16-bit, two 8-bit	1	1	Desktop	NP	Yes	NP	NP	AT	NP	$1,995-$3,395
Amdek Corp. **(800) 722-6335**	Amdek System 286 AIC	80286	16	DOS, OS/2, GW Basic	1-16	1.2	7	1	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	None	AT	Dealer	$2,399
	Amdek System 286 10	80286	10	DOS, OS/2	512K-1M	1.2	7	1	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	None	AT	Dealer	$1,599
	Amdek System 286 A	80286	12.5	DOS, OS/2, GW Basic	1-16	40	7	2	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	None	AT	Dealer	$2,199-$2,999
	Amdek System 386E	80386	16	DOS, OS/2	1-6	40-512	6	2	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	None	AT	Dealer	$3,599-$4,299
	Amdek System 88	8088-1	10	DOS, OS/2, GW Basic	640K	NP	5	1	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	No	AT	Dealer	$950
Applied Digital Data Systems, Inc. **(516) 321-5400, Ext. 593**	Mentor 1700A	80286	10	Pick	640K	85-140	NP	3	1	Desktop	19 x 17 x 7	No	No	CGMA	AT	Third parties	$8,450-$11,100
	Mentor 1800	80386	16	Pick	2	85-140	NP	3	1	Desktop	19 x 17 x 7	No	No	CGMA	AT	Third parties	$10,600-$14,300
Arche Technologies **(415) 623-8100**	Triumph 286	80286-12	8, 12	DOS, Unix, OS/2	512K-16M	1.2-120	Two 8-bit, three 16-bit	2	2	Desktop	16.1 x 15.6 x 3.9	Yes	No	Hercules	AT	Vendor, dealer	$1,395-$1,595
	Triumph 88	V-20	4.77, 10	DOS	512K-640K	1.2-40+	Five 8-bit	2	2	Desktop	16.1 x 15.6 x 3.9	No	No	Hercules	XT	Vendor, dealer	$1,195
	Rival 286	80286-12	8, 12	DOS, OS/2, Unix	640K-16M	1.2-120	Two 8-bit, six 16-bit	2	2	Desktop	17.3 x 16.5 x 6.2	Yes	No	Hercules	AT	Vendor, dealer	$2,095
	Rival 286-16	80286-16	8, 16	DOS, OS/2, Unix	1-16	1.2-120	Two 8-bit, six 16-bit	2	2	Desktop	17.1 x 16.5 x 6.2	Yes	No	Hercules	AT	Vendor, dealer	$2,395
	Pro-File 286	80286	8, 16	DOS, OS/2, Unix	1-16	1.2-120	Two 8-bit, six 16-bit	2	2	Floorstanding	55 x 24 x 19.5	Yes	No	Hercules	AT	Vendor, dealer	$2,595
	Pro-File 386	80386	10, 20	DOS, OS/2, Unix	2-16	1.2-120	Two 8-bit, four 16-bit, two 32-bit	2	2	Floorstanding	55 x 24 x 19.5	Yes	No	Hercules	AT	Vendor, dealer	$4,095
	Rival 386	80386	10, 20	DOS, OS/2, Unix	2-16	1.2-120	Two 8-bit, four 16-bit, two 32-bit	2	2	Desktop	17.1 x 16.5 x 6.2	Yes	No	Hercules	AT	Vendor, dealer	$3,895
AST Research, Inc. **(714) 863-1333**	Premium 386/33	80386	33	DOS, OS/2, Xenix	2-36	110-640	One 8-bit, three 16/32 bit, three 16-bit	2	1	Desktop	19.3 x 16.5 x 6.3	Yes	Yes	None	AT	Dealer, third parties	$6595-$10,245
	Premium Workstation/386SX, Model 3, 5, 45V	80386SX	16	DOS, OS/2	1-16	40	Two 8/16-bit	2	1	Desktop	16.0 x 14.8 x 3.4	Yes	Yes	None (VGA, Model 45V only)	AT	Vendor, dealer, third parties	$2,695-$3,695
	Premium 386/25	80386	25	DOS, OS/2, Xenix	2-36	90-640	Three 32-bit, one 8-bit, three 16-bit	2	1	Desktop	19.3 x 16.5 x 6.3	Yes	Yes	NP	AT	Vendor, dealer, third parties	$5,695-$9,345
	Premium 386/C	80386	20	DOS, OS/2, Xenix	1-16	40-320	One 32-bit, two 8-bit, four 16-bit	Two	One	Desktop	19.3 x 16.5 x 6.3	Yes	Yes	NP	AT	Vendor, dealer, third parties	$4,395-$8,395
	Premium 386/16	80386	16	DOS, OS/2, Xenix	1-16	40-320	One 32-bit, five 16-bit, one 8-bit	One	One	Desktop	19.3 x 16.5 x 6.3	Yes	Yes	NP	AT	Vendor, dealer, third parties	$3,295-$4,195

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Further product information is available from the vendors.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HARDWARE ROUNDUP

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DESKTOP OR PORTABLE	FOOTPRINT (inches)	OS/2 SUPPORT	VERSION OF OS/2 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
AST Research, Inc. **(714) 863-1333**	Premium Workstation/286	80286	10	DOS, OS/2, Unix, Xenix	512K-4M	1.2-40	Three 16-bit, one 8-bit	1	1	Desktop	16 x 14.8 x 3.4	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,445-$2,595
	Bravo/286	80286	8	DOS, OS/2, Unix, Xenix	512K-4M	1.2-40	Three 16-bit, one 8-bit	1	1	Desktop	15 x 15.3 x 5	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,245-$1,995
	Premium/286, Model 70	80286	10	DOS	512K-16M	40	One 8-bit, six 8-/16-bit	1	1	Desktop	19.3 x 16.5 x 6.3	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,895
AT&T **(800) 247-1212**	6386/25 Models 311, 313, 314	80386	25	DOS, OS/2, Unix System V/386	NP	80-380	Two 32-bit, one XT, five	2	1	Desktop	21.3 x 18.5 x 6.5	Yes	Yes	None	AT	NP	$6,695-$8,995
	6386/SX Models 301, 302, 303	80386SX	16	DOS, OS/2, Unix System V	2-16	40-80	One XT, three AT	2	1	Desktop	1.9 x 19.3 x 15	Yes	Yes	VGA	AT	Vendor	$2,995-$4,795
Bull H. N. Information Systems, Inc. **(617) 895-6000**	AP-L	80286	12	DOS	1-2	20-40	2	1	1	Portable	12.2 x 12.2 x 3.1	No	No	CGA	AT	Vendor	$4,995-$5,595
	SX-V16	80386SX	16	DOS, OS/2	1-15	44-640	Six 16-bit, two 8-bit	1	1	Desktop	21.2 x 16.5 x 6.1	Yes	No	NP	AT	Vendor	$3,345-$6,525
	AP-M Series	80286	10	DOS, OS/2	640K-8.6M	20-154	Five 16-bit, two 8-bit	1	1	Desktop	16.5 x 16.5 x 6	Yes	No	NP	AT	Vendor	$1,895-$3,295
	SP-V20	80386	20	DOS, OS/2	2-16	44-640	Six 16-bit, two 8-bit	2	1	Desktop	21.2 x 16.5 x 6.1	Yes	No	NP	AT	Vendor	$5,565-$9,055
Compaq Computer Corp. **(713) 370-0670**	Compaq Deskpro 286 Model 1, 20, 40	80286	12	DOS, OS/2	640K-2.1M	130, 20-130, 40-130	Five 8-/16-bit, two 8-bit	1	1	Desktop	16.5 x 19.8 x 6.4	Yes	Yes	NP	AT	Dealer	$2,699, $3,599, $4,199
	Compaq Deskpro 286E, Model 1, 20, 40	80286	12	DOS, OS/2	1-13	1.44-2.8, 20, 40	One 16-bit, four 8-/16-bit	1	1	Desktop	14.8 x 15.8 x 5.9	Yes	Yes	NP	AT	Dealer	$2,699, $3,199, $3,599
	Compaq SLT/286, Model 20, 40	80C286	12	PC-DOS, OS/2	640K-3.64M	20, 40	Two 8-/16-bit	1	1	Portable	13.5 x 8.5 x 4.5	Yes	Yes	VGA	AT	Dealer	$5,399, $5,999
	Compaq Deskpro 386/20E Model 1, 40, 110	80386	20	DOS, OS/2	1-4	1.44, 40, 110	Four 16-bit, one 32-bit	1	1	Desktop	15 x 16 x 6	Yes	Yes	VGA	AT	Dealer	$5,199, $6,099, $6,999
	Compaq Deskpro 386S Model 1	80386SX	16	DOS, OS/2	1-13	1.44-110	One 16-bit, four 8-bit	1	1	Desktop	15.8 x 14.8 x 5.9	NP	Yes	VGA	AT	Dealer	$3,299
	Compaq Deskpro 386S Model 40	80386SX	16	DOS, OS/2	1-13	40	One 16-bit, four 8-bit	1	1	Desktop	15.8 x 14.8 x 5.9	NP	Yes	VGA	AT	Dealer	$4,199
	Compaq Deskpro 386S Model 84	80386SX	16	DOS, OS/2	1-13	84-110	One 16-bit, four 8-bit	1	1	Desktop	15.8 x 14.8 x 5.9	NP	Yes	VGA	AT	Dealer	$4,699
	Compaq Portable 386 Model 100	80386	20	DOS, OS/2	1-2	100-1600	Two 8-/16-bit	1	1	Portable	10 x 16 x 8	Yes	Yes	CGA	AT	Dealer	$9,999
	Compaq Deskpro 386/25 Model 60, 110, 300	80386	25	DOS, OS/2	1	60, 110, 300	Five 16-bit, two 8-bit, one 32-bit	1	1	Desktop	17 x 20 x 6	Yes	Yes	NP	AT	Dealer	$7,999, $8,999, $11,999
	Compaq Deskpro 386/33 Model 84, 320, 650	80386	33	DOS, OS/2, Unix	2-16	84, 320, 650	One 8-bit, five 8-/16-bit	1	1	Desktop	19.2 x 17.7 x 6.5	Yes	Yes	VGA	AT	Dealer	$10,499, $14,999, $17,999
	Compaq Portable II Model 2, 4	80286	8	DOS, OS/2	256K-640K, 640K-4.1M	20	One 16-bit, one 8-bit	1	1	Portable	17.7 x 13.9 x 7.5	Yes	Yes	NP	AT	Dealer	$2,699, $3,999
	Compaq Portable III Model 20, 40	80286	12	DOS, OS/2	640K-6.6M	20, 40	Two 8-/16-bit	1	1	Portable	10 x 16 x 8	Yes	Yes	CGA	AT	Dealer	$4,999, $5,799
	Compaq Portable 386 Model 40	80386	20	DOS	1-2	40-100	Two 8-/16-bit	1	1	Portable	10 x 16 x 8	Yes	NP	CGA	AT	Dealer	$7,999
Cordata, Inc. **(213) 603-2901**	CS4605	80286	12	DOS, OS/2	512K-4M	0	Two XT, six AT	2	1	Desktop	16.6 x 19.4 x 6.3	Yes	No	None	AT	Vendor	$1,495
	CS5000	80386	20/8, 16/8	DOS, OS/2	1-16	80	Five 16-bit, one 8-bit	2	1	Desktop	19.5 x 17 x 6.3	Yes	No	None	AT	Vendor	$3,195-$6,395
Data General Corp. **(800) 328-2436**	Dasher/286-12c	80286	12	DOS	1-4	1.44-40	Two 16-bit	2	1	Desktop	12 x 15.5 x 3.8	No	No	VGA	AT	Vendor	$2,295-$5,300
	Dasher/386SX	80386SX	16	DOS, OS/2	2-8	40-200	Three 16-bit, one 8-bit	2	1	Desktop	17.5 x 16.3 x 6.3	Yes	No	VGA	AT	Vendor	$3,800-$9,600
	Dasher/386-25	80386	25	DOS, OS/2, 386/IX	2-16	156-322	Two 32-/16-bit, five 16-/8-bit, one 8-bit	2	1	Desktop	21.3 x 18.7 x 6.5	Yes	No	NP	AT	Vendor	$8,500-$20,700
Datamedia Corp. **(603) 886-1570**	Netmate/XLS, Models 386/20-00, 01, 08	80386	20	DOS, OS/2, Unix	2-16	80 (Model 08)	32-bit	1	1	Desktop	15.2 x 14.5 x 4.5	Yes	Yes	VGA, VGA+	AT	Vendor, third parties	$4,595, $4,795, $6,395
	Netmate/XLS, Models 386/16-00, 01, 04	80386SX	16	DOS, OS/2, Unix	2-16	0	Three AT	1	1	Desktop	15.2 x 14.5 x 4.5	Yes	Yes	VGA, VGA+	AT	Vendor, third parties	$2,795, $2,995, $3,965
Decision Data **(800) 523-6529**	PWS 5053	80286	12/8	DOS, OS/2	1-16	100	Four 16-bit	1	1	Desktop	14.1 x 16.2 x 5	Yes	No	Super EGA	AT	Vendor	$1,694-$3,053
	PWS 5070	80386	16	DOS, OS/2	2-16	200	One 32-bit, five 16-bit, two 8-bit	2	1	Desktop	21 x 16.4 x 6.5	Yes	No	NP	AT	Vendor	$2,893-$5,557
Dell Computer Corp. **(800) 426-5150**	Dell System 200	80286	12.5	DOS, OS/2	640K-16M	20-322	Four 16-bit, two 8-bit	1	2	Desktop	21.1 x 17.6 x 6.4	Yes	Yes	None	AT	Third parties	$1,699-$4,599
	Dell System 220	80286	20	DOS, OS/2	1-16	40-100	Three 16-bit	2	1	Desktop	15.1 x 15.6 x 4	Yes	Yes	VGA	AT	Third parties	$2,299-$3,899
	Dell System 310, 325	80386	20	DOS, OS/2, Unix	1-16 (310 only)	40-322 (310 only)	Six 16-bit, two 8-bit, one 32-bit	2	1	Desktop	21.1 x 17.6 x 6.4	Yes	Yes	None	AT	Third parties	$3,699, $5,499
	Dell System 316	80386SX	16	DOS, OS/2, Unix	1-16	40-322	Six 16-bit, two 8-bit	2	1	Desktop	21.1 x 17.6 x 6.4	Yes	Yes	None	AT	Third parties	$2,999-$5,549
Digital Equipment Corp. **(508) 493-5111**	Decstation 316, 320	80386	16, 20	DOS	1-16, 2-16	40-150	Six AT, two XT	1	1	Desktop	19 x 18 x 6.5	No	No	VGA	AT, XT	Vendor	$2,600, $4,075
Epson America, Inc. **(800) 922-8911**	Equity II+	80286	8, 12	DOS, OS/2	640K-15.5M	1.2-40	Three 16-bit, three 8-bit	1	1	Desktop	15.7 x 16.3 x 6.1	Yes	Yes	None	AT	Dealer	$1,899-$2,999
	Equity III+	80286	6, 8, 12	DOS, OS/2	640K-15.5M	1.2-40	Seven 16-bit, two 8-bit	1	1	Desktop	19.6 x 17.4 x 6.6	Yes	Yes	None	AT	Dealer	$2,199-$3,299

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DESKTOP OR PORTABLE	FOOTPRINT (inches)	OS/2 SUPPORT	VERSION OF OS/2 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Epson America, Inc. **(800) 922-8911**	Equity 386/20	80386	8, 20	DOS, OS/2	640K-16M	40-90	Six 16-bit, three 8-bit	1	1	Desktop	19.6 x 17.4 x 6.6	Yes	Yes	None	AT	Dealer	$3,999-$6,399
	Equity LT	V-30	4.77, 10	DOS	640K	720K-20M	2	1	1	Portable	13.6 x 12.2 x 3.1	No	No	CGA	ISA	Dealer	$1,948-$2,998
Everex Systems, Inc. **(800) 624-3282**	Step 286/12, 16, 20	80286	12, 16, 20	DOS, OS/2, Unix	1-16	40-680	Two XT, six AT	1	1	Desktop	21.2 x 6.2 x 16.4	Yes	Yes	None	AT	Vendor, dealer	$2,099-$4,099
	Step 386IS	80386SX	16	DOS, OS/2, Unix	1-16	40-680	Two XT, five AT,	1	1	Desktop	21.2 x 6.2 x 16.4	Yes	Yes	None	AT	Vendor, dealer	$2,799-$8,799
	Step 386/16, 20, 25, 33	80386	16, 20, 25, 33	DOS, OS/2, Unix	1-16	40-680	Two XT, five AT	1	1	Desktop	21.2 x 6.2 x 16.4	Yes	Yes	None	AT	Vendor, dealer	$2,799-$8.799
	AGI Model 1700A, C	80286	10, 12	DOS, OS/2, Unix	512K-16M, 1-16	680	Two XT, six AT	1	1	Desktop	21.2 x 6.2 x 16.4	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,200-$2,000
	AGI Model 3000G	80386SX	16	DOS, OS/2, Unix	1-16	680	Two XT, five AT	1	1	Desktop	21.2 x 6.2 x 16.4	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,800-$6,000
	AGI Model 3000B, D, L, K	80386	33, 20, 25, 33	DOS, OS/2, Unix	1-16	680	Two XT, five AT	1	1	Desktop	21.2 x 6.2 x 16.4	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,800-$6,000
Grid Systems Corp. **(415) 656-4700**	Gridcase 1530	80386	10	DOS, Xenix System V	1-8	1.4-100	None	1	1	Portable	15 x 11.5 x 2.3	No	NP	CGA, RGB	AT	Vendor, third parties	$4,695-$14,340
	Grid-Desk 386 ISX	80386SX	16	DOS, OS/2, SCO Xenix	1-16	1.4-80	Four AT, two 32-bit	1	1	Desktop	17 x 15.75 x 6.25	Yes	Yes	VGA	AT, MCA	Vendor, third parties	$2,599-$4,897
	Grid-Desk 386 ME	80386	20	DOS, OS/2, Xenix	2-16	1.4-80	Five MC cards	1	1	Desktop	17 x 15.75 x 6.13	NP	Yes	VGA	AT, MCA	Vendor, third parties	$4,999-$7,447
	Grid-Desk 286 IS	80286	12	DOS, OS/2, Xenix	1-14	1.4-80	Four AT, two XT	1	1	Desktop	17 x 15.75 x 6.25	Yes	Yes	VGA	AT	Vendor, third parties	$2,395-$5,062
	Gridcase 1520	80C286	10	DOS, SCO Xenix System V	1-4	1.4-100	None	1	1	Portable	15 x 11.5 x 2.3	No	NP	CGA, RGB	AT	Vendor, third parties	$3,495-$9,845
	Gridcase 1535 EXP	80386	12.5	DOS, SCO Xenix System V	1-8	1.4-100	Two AT, XT	1	1	Portable	15.1 x 11.5 x 2.5	No	NP	CGA, RGB	AT	Vendor, third parties	$6,995-$11,745
Hewlett-Packard Co. **(800) 752-0900**	HP Vectra QS/16S	30386SX	16/8	DOS, OS/2, SCO Unix	1-8	40-152	One 8-bit, six 16-bit	1	1	Desktop	16.7 x 15.4 x 6.3	Yes	Yes	VGA	AT	Vendor, dealer	$3,295-$4,395
	HP Vectra QS/20	80386	20	DOS, Xenix 386	1-16	40-152	One 8-bit, six 16-bit	1	1	Desktop	16.7 x 15.4 x 6.3	Yes	Yes	VGA	AT	Vendor, dealer	$4,495-$6,999
	HP Vectra RS/20C, 25C	80386	20, 25	DOS, OS/2, SCO Unix	1-16	Up to 620	Six 16-bit, two 8-bit	1	1	Floor mount	8.3 x 20 x 24	Yes	Yes	VGA	AT	Vendor, dealer	$5,699-$10,145
	HP Vectra CS	8086	7.16	DOS	640K-8.6M	20	7	1	1	Desktop	16.7 x 15.4 x 6.3	No	No	VGA	XT	Vendor, dealer	$1,699-$2,599
	HP Vectra ES, ES/12	80286	8, 12	DOS	640K-16M	20, 20-80	Two 8-bit, five 16-bit	1	1	Desktop	16.7 x 15.4 x 6.3	Yes	Yes	VGA	AT	Vendor	$2,199, $2,495
	HP Vectra LS/12	80286	12	DOS	1	40	None	1	1	Portable	12.2 x 12.2 x 3.1	No	No	CGA	AT	NP	$4,999-$5,599
Hyundai Electronics America **(408) 473-9200**	Super 286C	80286	8/10, 6/12	DOS	640K-1M, 1-4	1.2-40	Four 16-bit, two 8-bit	1	1	Desktop	16.5 x 16.5 x 6.2	No	No	None	AT	Dealer	$1,195
	Super 286N	80286	8/10, 6/12	DOS	640K-1M, 1-4	1.2-40	Four 16-bit, two 8-bit	1	1	Desktop	16.5 x 16.5 x 6.2	Yes	No	None	AT	Dealer	$1,595
	Super 386C	80386	8/20	DOS, OS/2	1-8	1.2-100	Four 16-bit, two 8-bit	1	1	Desktop	15.9 x 16.5 x 6.2	Yes	No	None	AT	Dealer	$2,995-$4,495
	Super 286	80286	8/10	DOS, OS/2	1-4	1.2-40	Six 16-bit, six 8-bit	1	1	Desktop	16.5 x 16.0 x 6.2	Yes	No	None	AT	Dealer	$1,195-$2.595
	Super 286E	80286	8/12	DOS, OS/2	640K-1M	1.2-40	Four 16-bit, two 8-bit	1	1	Desktop	16.6 x 16.2 x 5.9	Yes	No	None	AT	Dealer	$1,395-$2,145
	Super 386S	80386	8/16	DOS, OS/2	1-8	1.44-100	Two 8-bit, four 16-bit	1	1	Desktop	15.1 x 15.3 x 5.9	Yes	No	None	AT	Dealer	$2,195-$3,695
	Super 286X	80286	6/12	DOS, OS/2	512K-4M	1.44-40	Three 16-bit, one 8-bit	1	1	Desktop	15.2 x 15.1 x 4.5	Yes	No	None	AT	Dealer	$1,195-$1,945
	Super LT-3	80C286	8/10	DOS, OS/2	1-2	1.44-20	None	1	1	Portable	12 x 13.2 x 2.8	Yes	No	EGA, CGA, MDA	AT	Dealer	$2,495-$2,995
IBM **(914) 934-4000**	Personal System/2 Model 50 Z	80286	10	DOS, OS/2	1-16	30-60	NP	1	1	Desktop	14.2 x 16.5 x 5.5	Yes	NP	NP	NP	NP	$3.250-$3,650
	Personal System/2 Model 60	80286	10	DOS, OS/2	1-16	44-185	NP	1	1	Floor-standing	6.5 x 19 x 23.5	Yes	NP	NP	NP	NP	$5,295-$5,795
	Personal System/2 Model 70 386	80386	16, 20, 25	DOS, OS/2	1-16	60-120	NP	1	1	Desktop	14.2 x 16.5 x 5.5	Yes	NP	NP	NP	NP	$5,495-$8,995
	Personal System/2 Model 80 386	80386	16, 20	DOS, OS/2	1-16	44-628	NP	1	1	Floor-standing	6.5 x 19 x 23.5	Yes	NP	NP	NP	NP	$6,995-$11,995
	Personal System/2 Model 30 286	80286	10	DOS, OS/2	0.5-16	Up to 30	Three	1	1	Desktop	15.6 x 16 x 4	Yes	NP	NP	NP	NP	$1,995-$2,545
	Personal System/2 Model 55 SX	80386SX	16	DOS, OS/2, AIX	1-16	30-60	Three	1	1	Desktop	15.6 x 16 x 4	Yes	NP	NP	NP	NP	$3,895-$4,295
	Personal System/2 Model P70 386	80386	20	DOS, OS/2, AIX	4-16	60-120	2	1	1	Portable	12 x 18.3 x 5	Yes	NP	NP	NP	NP	$7,695-$8,295
Lanier Business Systems, a Division of Harris Corp. **(800) 727-8001**	286/12	80286	12	DOS, OS/2	1-8	20-300	Five 16-bit, two 8-bit	1	1	Desktop	18 x 16 x 7	Yes	No	None	AT	Vendor, dealer	$2,445
	286/12-SL	80286	12	DOS, OS/2	1-8	20-40	Two 16-bit	1	1	Desktop	18 x 12 x 5	Yes	No	None	AT	Vendor, dealer	$2,295
	386/16, SX/16	80386, SX	16	DOS, OS/2	1-10	300	Five 16-bit, two 8-bit	1	1	Desktop	18 x 16 x 7	Yes	No	None	AT	Vendor, dealer	$3,495, $2,245
	386/16-SL	80386	16	DOS, OS/2	1-10	40	Two 16-bit	1	1	Desktop	18 x 12 x 5	Yes	No	None	AT	Vendor, dealer	$3,345
	386/20, 25	80386	20, 25	DOS, OS/2	2-10	300	Five 16-bit, two 8-bit	1	1	Desktop	18 x 16 x 7	Yes	No	None	AT	Vendor, dealer	$4,495, $4,995

HARDWARE ROUNDUP

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DESKTOP OR PORTABLE	FOOTPRINT (inches)	OS/2 SUPPORT	VERSION OF OS/2 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Leading Edge Hardware Products, Inc. **(800) 343-6833**	Leading Edge Model D	8088-2	4.77, 7.16	DOS	512K-768K	30	Four 8-bit	One	One	Desktop	14 x 15.5 x 5.5	No	No	MDA, Hercules, RGB	NP	Dealer	$995-$1,395
	Leading Edge Model D2	80286	8, 12	DOS, OS/2	12K-1.5M	30-65	Two 8-bit, four 16-bit	One	One	Desktop	16 x 15.5 x 6.1	Yes	No	CGA, EGA, MDA, VGA	AT	Dealer	$1,795-$2,595
	Leading Edge Model D3	80386	8, 16	DOS, OS/2	1-8	65	Two 8-bit, four 16-bit	Two	One	Desktop	16 x 15.5 x 6.1	Yes	No	CGA, EGA, MDA, VGA	AT	Dealer	$2,995
Mitsubishi Electronics America **(213) 217-5732**	MP286	80286	6, 8, 12	DOS, Xenix	640K-5.64M	1.2-40	Four 16/8-bit, two 8-bit	One	One	Desktop	15 x 15 x 6.1	Yes	Yes	None	AT	Vendor, dealer, third parties	$1,895-$2,995
	MP286L	80286	12	DOS	640K-2.64	1.44-40	Four proprietary	Two	One	Desktop, portable	12.3 x 14.2 x 3.5	Yes	Yes	None	AT	Vendor	$3,195-$5,395
	MP386	80386	16	DOS	1-10	1.2-70	Two 32-/16-/8-bit, six 16-bit, two 8-bit	Two	One	Desktop	22.8 x 16.8 x 6.4	Yes	Yes	None	AT	Vendor, dealer, third parties	$3,995-$5,595
	MP386S	80386SX	16	DOS	2-16	1.2-40	Six 8-/16-bit	Two	One	Desktop	15 x 15 x 6.1	Yes	Yes	None	AT	Vendor, dealer, third parties	$2,995-$3,995
NCR Corp. **(800) 544-3333**	NCR PC 810	80286-10	6, 10	DOS, OS/2, NCR 386/IX	640K-16	Up to 115	Six 16/8-bit, two 8-bit	One	One	Desktop	21.2 x 16.5 x 6.1	Yes	No	CGA, EGA, VGA	AT	Vendor, dealer	$2,495-$5,365
	NCR PC 920	80386-20	4.77-20	DOS, OS/2, NCR 386/IX	2-26	Up to 115	Eight 16-bit	One	One	Desktop	21.2 x 16.5 x 6.1	Yes	No	VGA	AT	Vendor, dealer, third parties	$4,695-$7,795
	NCR PC 925	80386-25	25	DOS, OS/2	4-16	Up to 327	One 8-bit, six 16-bit, one 32-bit	One	One	Desktop	21.2 x 16.5 x 6.1	Yes	No	VGA	NP	NP	$8,950-$14,295
	NCR PC916SX	386SX-16	8, 16	DOS, OS/2, NCR 386/IX	1-16	Up to 115	Two 8-bit, six 16-bit	One	One	Desktop	21.2 x 16.5 x 6.1	Yes	No	VGA	AT	Vendor, dealer, third parties	$3,395-$6,395
NEC Information Systems Inc. **(508) 264-8000**	Power Mate 386/20	80386	20	DOS, OS/2, SCO Xenix/386	2-16	20-300	One 32-bit, five 8/16-bit, two 8-bit	Two	One	Desktop	21.2 x 16.5 x 6.3	Yes	Yes	CGA, EGA, VGA	AT	Vendor, dealer, third parties	$4,695-$9,995
	Power Mate 286	80286	8-10	DOS, OS/2, SCO Xenix	512K-16M	NP	Four 8-/16-bit	One	One	Desktop	17 x 16.2 x 5	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$1,299-$1,499
	Power Mate 286 Plus	80286	12	DOS, OS/2, SCO Xenix	512K-16M	42-140	Four 8-/16-bit	One	One	Desktop	17 x 16 x 4	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$1,999-$3,899
	Power Mate 2	80286	8-10	DOS, OS/2, SCO Xenix	640K-10.6M	20-66	Two 8-bit, six 8-/16-bit	Two	One	Desktop	21.2 x 16.5 x 6	Yes	Yes	CGA, CGA, VGA	AT	Vendor, dealer, third parties	$2,595-$4,695
	Power Mate SX Plus	80386SX	16	DOS, OS/2, SCO Xenix/386	2-16	42-140	Four 8/16	One	One	Desktop	17 x 16 x 4.8	Yes	Yes	Super VGA	AT	Vendor, dealer, third parties	$2,699-$4,599
	Power Mate Portable Plus	80286	12	DOS, OS/2, SCO Xenix	1-16	42-100	Three 8-/16-bit	One	One	Portable	15.5 x 7.6 x 11.2	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$4,999-$5,999
	Power Mate Portable SX	80386SX	16	DOS, OS/2, SCO Xenix/386	2-16	42-100	Three 8-/16-bit	One	One	Portable	15.7 x 7.6 x 11.2	Yes	Yes	CGA, EGA, VGA	AT	Vendor, dealer, third parties	$5,999
Olivetti USA **(201) 526-8200**	M250	80286	8	DOS, OS/2	1-16	20-40	Three 8-/16-bit	One	One	Desktop	16.2 x 15.5 x 4.3	Yes	Yes	VGA	AT	Vendor, dealer	$2,640-$2,840
	M290	80286	12	DOS, Xenix/286, OS/2	1-14	100	Three 8-bit, five 16-bit	One	One	Desktop	NP	Yes	Yes	VGA	AT	Vendor, dealer	$2,630-$3,930
	M300	80386SX	16	DOS, OS/2, Unix, Xenix 286/386	1-16	40-100	Five 16-bit, three 8-bit	One	One	Desktop	14 x 15 x 7	Yes	Yes	VGA	AT	Vendor, dealer	$3,575-$4,275
	M380 XP1	80386	20	DOS, OS/2, Unix, Xenix	1-64	80	Three 16-bit, two 8-bit, three 32-bit	One	One	Desktop	15 x 14 x 5.5	Yes	Yes	VGA	AT	Vendor, dealer	$6,680
	M380 XP3	80386	20	DOS, OS/2, Unix 386, Xenix 386	2-64	135	Two 8-bit, three 16-bit, three 32-bit	One	One	Desktop	18.9 x 16 x 7.2	Yes	Yes	VGA	AT	Vendor, dealer	$8,375
	M380 XP5, 7, 9	80386	20, 25, 33	DOS, OS/2, Unix 386, Xenix 386	4-64	135	Two 8-bit, four 16-bit, four 32-bit	One	One	Floor-standing	8.2 x 22.2 x 24.1	Yes	Yes	VGA	AT	Vendor, dealer	$9,990, $10,775, $15,375
Packard Bell **(800) 733-4422**	PB 686	80286	8, 12	DOS, OS/2	640K	40	Five 16-bit	Two	One	Desktop	15.2 x 15.5 x 5.5	Yes	No	None	AT	NP	$1,495-$2,095
	PB 800/16	80286	8, 16	DOS, OS/2	1	40	Six 16-bit, two 8-bit	Two	One	Desktop	14.5 x 16.6 x 7	Yes	No	VGA	AT	NP	$2,249-$2,795
Panasonic **(201) 348-7000**	Business Partner FX-1650	8086	8	DOS	640K	720K-20M	Five XT	One	One	Desktop	15.5 x 13.1 x 5.1	NP	NP	CGA, MDA, Hercules	XT	Dealer	$999-$1,499
	Business Partner FX-1750	80286	8	DOS	640K	720K-20M	Five XT	One	One	Desktop	15.5 x 13.1 x 5.1	NP	NP	CGA, MDA, Hercules	XT	NP	$1,299-$1,799
	Business Partner FX-1850	80286	12	DOS	640K-16	NP	Four AT, three XT	One	One	Desktop	15.75 x 17 x 6.25	NP	NP	VGA, EGA	AT	Dealer	$1,899-$3,045
	Business Partner FX-1950	80386	20	DOS, OS/2	2-16	1.44-40	Six AT, two XT, one 32-bit	One	One	Desktop	19 x 18 x 6.5	Yes	NP	VGA, EGA	AT	NP	$4,199-$5,299
Sanyo Business Systems **(201) 440-9300**	MBC-17 Plus	80286	6, 10	DOS, OS/2	1-15	Up to 40	Six	One	One	Desktop	13 x 16.6 x 6.8	Yes	No	None	AT	Vendor, dealer	$1,689-$2,488
	MBC-18 Plus	80386	16	DOS	1-15	Up to 40	Six	One	One	Desktop	13 x 16.6 x 6.8	Yes	No	None	AT	Vendor, dealer	$3,199-$3,988

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DESKTOP OR PORTABLE	FOOTPRINT (inches)	OS/2 SUPPORT	VERSION OF OS/2 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Sharp Electronics Corp. **(201) 529-9500**	PC-4602	V-40	10	DOS	640K-1.6M	40	None	1	1	Portable	12.1 x 13.7 x 3.2	No	No	CGA	NP	Vendor, dealer	$2,196-$3,595
	PC-4641	V-40	10	DOS	640K-1.6M	40	None	1	1	Portable	12.1 x 13.7 x 3.2	No	No	CGA	NP	Vendor, dealer	$2,196-$3,595
	PC-5541	80286	12	DOS, OS/2	640K-3.6M	40	None	1	1	Portable	12 x 14.3 x 3.4	Yes	No	VGA	NP	Vendor, dealer	$5,595
Tandon Corp. **(805) 523-0340**	386/20	80286	20	DOS	1-16	40-110	Two 8-bit, six 16-bit	1	1	Desktop	21.1 x 16.3 x 6.3	No	No	None	AT	Vendor, dealer, third parties	$2,309-$3,149
	386/25	80386	25	DOS	1-16	110-330	Five 16-bit, two 8-bit	1	1	Desktop	21 x 16.3 x 6.3	No	No	NP	AT	Vendor, dealer, third parties	$3,051,
	386/33	80386	33	DOS	1-16	110-660	Five 16-bit, two 8-bit	1	1	Desktop	21 x 16.3 x 6.3	No	No	NP	AT	Vendor, dealer, third parties	$3,429
	386SX	80386SX	16, 32	DOS	1-16	30-40	Four 16-bit, one 8-bit	1	1	Desktop	12.6 x 15.7 x 6.3	No	No	NP	AT	Vendor, dealer, third parties	$1,609-$2,075
	PCA/12	80286	12	DOS	640K-16M	20-40	Three 16-bit	2	1	Desktop	18.3 x 16 x 5	No	No	NP	AT	Vendor, dealer, third parties	$986
	PCA/12-SL	80286	12	DOS	640K-16M	20-40	Three 16-bit, one 8-bit	2	1	Desktop	18.3 x 16 x 5	No	No	NP	AT	Vendor, dealer, third parties	$1,490
	PAC 286/12	80286	12	DOS	1-16	30-40	Two 8-/16-bit, one 8-bit	1	1	Desktop	12.8 x 15.7 x 6.3	No	No	None	AT	Vendor, dealer, third parties	$1,286-$1,752
Tandy Corp. **(817) 390-3011**	Tandy 1000 TL	80286	8, 4	DOS	640K-768K	720K-40M	Five 8-bit	1	1	Desktop	15.5 x 13.1 x 5.1	No	No	CGA, CGA+, Hercules, MDA	XT	Vendor	$1,299-$2,098
	Tandy 3000 NL	80286	10	DOS, OS/2	512K-16M	1.44-344	Three 8-bit, five 16-bit	1	1	Desktop	15.8 x 17 x 6.3	Yes	Yes	None	AT	Vendor	$1,699
	Tandy 4000	80386	16	DOS, OS/2, Xenix 386	1-16	1.44-344	Two 8-bit, six 16-bit, one 32-bit	1	1	Desktop	19 x 18 x 6.5	Yes	Yes	None	AT	Vendor	$2,999
	Tandy 4000 LX	80386	20	DOS, OS/2, Xenix 386	2-16	1.44-344	Two 8-bit, six 16-bit, one 32-bit	1	1	Desktop	19 x 18 x 6.5	Yes	Yes	None	AT	Vendor	$4,399
	Tandy 4000 SX	80386SX	16	DOS, OS/2	1-16	1.44-344	Four 16-bit	1	1	Desktop	15.8 x 17 x 16.3	Yes	Yes	VGA	AT	Vendor	$2,599
	Tandy 5000 MC	80386	20	DOS, OS/2, Xenix 386	2-16	1.44-344	Three 16-bit, four 32-bit	1	1	Desktop	17 x 15.5 x 6.1	Yes	Yes	VGA	MCA	Vendor	$4,999
Televideo Systems, Inc. **(408) 945-8333**	Teloas II, Model NH	80286	12	DOS, OS/2, Unix, Xenix	1-16	40	Seven 16-bit, one 8-bit	2	1	Desktop	NP	Yes	No	None	AT	Third parties	$1,795-$2,395
	Tele 386-25, Model NH	80386	25	DOS, OS/2, Unix	4-16	600	Ten 16-bit, two 8-bit	2	1	Desktop	20.8 x 16.3 x 6.1	Yes	No	None	AT	Third parties	$5,995-$7,950
	Teloas III Z	80386	16	DOS, OS/2, Unix, Xenix	1-16	150	Ten 16-bit, two 8-bit	2	1	Desktop	20.8 x 16.3 x 6.1	Yes	No	None	AT	NP	$2,995-$3,495
Toshiba America Information Systems, Inc. **(800) 457-7777**	T1200H and HB	80C86	9.54,	DOS	1-2	20	1	1	1	Portable	12.2 x 12 x 2.6	No	No	CGA	NP	Vendor, dealer, third parties	$2,799
	T1200F and FB	80C86	4.77	DOS	1-2	720K	2	1	1	Portable	12.2 x 12 x 2.6	No	No	CGA	NP	Vendor, dealer, third parties	$2,099
	T3100E	80286	12	DOS, OS/2	1-5	20	1	2	1	Portable	12.2 x 14.2 x 3.1	Yes	No	CGA	AT	Vendor, dealer, third parties	$4,199
	T5100, T5100/100	80386	8, 16	DOS, OS/2	2-4	40	1	1	1	Portable	12.2 x 14.2 x 3.5	Yes	No	EGA	AT	Vendor, dealer, third parties	$6,499-$7,499
	T5200, T5200/100	80386	20	DOS, OS/2	2-8	40	2	2	1	Portable	14.6 x 15.6 x 3.9	Yes	No	VGA	AT	Vendor, dealer, third parties	$7,699-$8,299
	T3200	80286	12	DOS, OS/2	1-4	40	2	1	1	Portable	14.6 x 15.6 x 3.9	Yes	No	EGA	AT	Vendor, dealer, third parties	$5,299
	T1000	80C88	4.77	DOS	512K-1.2M	740K	2	1	1	Portable	12.2 x 11 x 2.1	No	No	CGA	NP	Vendor, dealer, third parties	$999
	T1600	80C286	12, 6	DOS	1-5	20	2	2	1	Portable	12.2 x 12.5 x 3.2	Yes	No	EGA	AT	Vendor, dealer, third parties	$4,999
Unisys Corp. **(800) 448-1424**	Personal Workstation series 300/10	80286	10	DOS, OS/2	640K-1.64M	20	Three 8-/16-bit	1	1	Desktop	15 x 15.7 x 4	Yes	No	None	AT	Vendor	$1,006-$2,380
	Personal Workstation Series 500/12	80286	12	DOS, OS/2	640K-4.64M	40	One 8-bit, three 8-/16-bit	1	1	Desktop	15 x 15 x 4	Yes	No	None	AT	Vendor	$2,325-$4,205
	Personal Workstation Series 800/16	80386	16	DOS, OS/2	1-16	1.2-334	Two 8-bit, four16-bit, one 32-bit	2	1	Desktop	21 x 17 x 6.5	Yes	No	EGA	AT	Vendor	$5,080-$7,880
	Personal Workstation Series 800/20	80386	20	DOS, OS/2	1-16	334	Two 8-bit, four 16-bit, one 32-bit	2	1	Desktop	21 x 17 x 6.5	Yes	No	None	AT	Vendor	$4,075-$8,695
	Personal Workstation Series 800/25A	80386	25	DOS, SCO-Xenix 386 System V	2-18	640	One 8-bit, five 8-/16-/32-bit	2	1	Desktop	21.3 x 18.7 x 6.5	Yes	No	None	AT	Vendor	$7,315-$10,685
Wang Laboratories, Inc. **(800) 522-9264**	PC 250/16	80286	16	DOS, OS/2, SCO Xenix 286	1-16	1.2-169	One 8-bit, four 16-bit	2	1	Desktop	16 x 16.3 x 6.3	Yes	Yes	NP	AT	Vendor	$2,095
	PC 350/16S	80386SX	16	DOS, OS/2, SCO Xenix 286	1-16	1.2-169	One 8-bit, four 16-bit	2	1	Desktop	16 x 16.3 x 6.3	Yes	Yes	NP	AT	Vendor	$2,695

COMPANY	PRODUCT	CPU	CLOCK SPEED (MHz)	OPERATING SYSTEM	INTERNAL MEMORY (megabytes)	DISK STORAGE (megabytes)	NUMBER AND TYPE OF EXPANSION SLOTS	NUMBER OF SERIAL PORTS	NUMBER OF PARALLEL PORTS	DESKTOP OR PORTABLE	FOOTPRINT (inches)	OS/2 SUPPORT	VERSION OF OS/2 SPECIFIC FOR SYSTEM	BUILT-IN GRAPHICS STANDARD	TYPE OF BUSES	SERVICE PROVIDED BY	PRICE
Wang Laboratories, Inc. (800) 522-9264	PC 280/20	80286	20	DOS, OS/2, SCO Xenix 286	1-16	1.2-643	Two 8-bit, six 16-bit	2	1	Desktop	21.4 x 16.3 x 6.6	Yes	Yes	NP	AT	Vendor	$2,995
	PC 350/16S	80386SX	16	DOS	2-16	1.44-78	Five 16-bit	1	1	Desktop	18.5 x 14.5 x 5.5	Yes	No	VGA	MCA	Vendor	$2,995
	PC 381	80386	16	DOS, OS/2, SCO Xenix 386	1-16	1.2-643	Two 8-bit, six 16-bit, one 32-bit	2	1	Desktop	16.3 x 21.4 x 6.6	Yes	Yes	NP	AT	Vendor	$3,195
	PC 382	80386	20	DOS, OS/2, SCO Xenix 386	1-16	1.2-643	Two 8-bit, six 16-bit, one 32-bit	2	1	Desktop	16.3 x 21.4 x 6.6	Yes	Yes	NP	AT	Vendor	$3,450
Wyse Technology (800) 438-9973	WY-3216	80386	16	DOS, Wyse SCO/Xenix, Wyse OS/2	1-16	40-150	Five 16-bit, two 8-bit	1	1	Desktop	21.1 x 17.9 x 6.4	Yes	Yes	None	AT	Vendor, dealer, third parties	$3,454-$7,654
	WY-2108	80286	8	DOS, Wyse SCO/Xenix, Wyse OS/2	512K-16M	20	Five 16-bit, two 8-bit	1	1	Desktop	15 x 16.6 x 6.2	NP	Yes	None	AT	Vendor, dealer, third parties	$1,454-$1,854
	WY-2112	80286	12.5	DOS, Wyse SCO/Xenix, OS/2	1-16	40	Four 16-bit, one 8-bit	1	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	None	AT	Vendor, dealer, third parties	$2,199-$2,899
	WY-2116	80286	16	DOS, Wyse SCO/Xenix, OS/2	1-16	40	Four 16-bit, one 8-bit	1	1	Desktop	15 x 16.6 x 6.2	Yes	Yes	None	AT	Vendor, dealer, third parties	$2,399-$3,099
Zenith Data Systems (800) 553-0331	Supersport 286 Model 20	80286	6/12	DOS, OS/2	1-2	20-40	3	1	1	Portable	12.2 x 12.2 x 3.1	Yes	Yes	CGA	AT	Vendor, dealer, third parties	$4,999-$5,599
	Supersport 286 Model 40	80286	6/12	DOS, OS/2	1-2	20-40	3	1	1	Portable	12.2 x 12.2 x 3.1	Yes	Yes	CGA	AT	Vendor, dealer, third parties	$4,999-$5,599
	Turbosport 386 Model 40	80386	12/16	DOS, OS/2	2-3	40	2	1	1	Portable	13.3 x 14.8 x 4.8	Yes	Yes	CGA	AT	Vendor, dealer, third parties	$7,999-$8,499
	Turbosport 386 Model 40M	80386	12/16	DOS, OS/2	2-3	40	2	1	1	Portable	13.3 x 14.8 x 4.8	Yes	Yes	CGA	AT	Vendor, dealer, third parties	$7,999-$8,499
	Z-286	80286	8	DOS, OS/2	512K-16M	20	One 8-bit, three 16-bit	1	1	Desktop	16 x 16.5 x 6.5	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$2,799
	Z-286 LP Series	80286	8, 12	DOS, OS/2	1-6	20-40	3	2	1	Desktop	14 x 15 x 3.9	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$2,499-$3,399
	Z-248/12	80286	12	DOS, OS/2	1-6	40-160	One 8-bit, four 8/16-bit	2	1	Desktop	21 x 16.5 x 6.5	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$2,299-$5,499
	Z-386	80386	16	DOS, OS/2, Xenix	1-16	40-160	Three 8-/16-/32-bit, one 8-/16-bit, one 8-bit	1	1	Desktop	21 x 16.5 x 6.5	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$3,999-$7,999
	Z-386/25	80386	25	DOS, OS/2	2-8	70-320	Three 32-bit, one 16-bit	2	1	Desktop	21 x 16.1 x 6.5	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$6,599-$11,999
	Z-386/33	80386	33	DOS, OS/2	2-8	150-320	Three 32-bit, one 16-bit	2	1	Desktop	21 x 16.1 x 6.5	Yes	Yes	VGA	AT	Vendor, dealer, third parties	$7,999-$13,499

The laptop

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company released a 32-bit, 386-based handheld workstation in August; accompanying radio transceivers are expected to ship by the end of the year. The units, targeted toward field operations, sell from $2,000 to $20,000, depending on configuration.

In a related move, the Federal Communications Commission smoothed the way for wireless LANs recently by announcing that it approved a nationwide radio frequency for mobile computer links.

New doings

The coming year will also see color screens on high-end models and the debut of disposable batteries, which may have life spans measured in 10s of hours, analysts say.

Probably the most significant swing factor in the foreseeable future will be market reaction to the long-awaited Apple Computer, Inc. Macintosh portable, which debuted last week.

The jury on the machine is still out, but weighing nearly 16 pounds and priced between $5,799 and $6,499, depending on the version, it is much heavier and more expensive than most users would have liked.

Popular despite price

Yet there are those who think that neither the price tag nor the weight will matter. According to Shaffer, Apple "won't be able to make enough to keep up with the demand." There are estimates that the company will sell at least 100,000 in the fiscal year beginning Oct. 1.

To sum up the state of the sector, given their current high price and the highly competitive state of the industry, laptops are not expected to flood the market in the near future.

However, with big guns such as Apple and Compaq aboard and continued improvements in functionality, portables will at least be firmly anchored in the personal computer mainstream. •

How the charts work

The Hardware Roundup charts, which began in the Sept. 18 issue with large, medium-scale and special-purpose systems, are intended as a guide to help readers interested in comparing products from major vendors in various size and price classes.

Computerworld has tried to present complete, accurate listings of as many products as possible by contacting vendors directly for information. Space does not permit including all products or vendors in each category.

Where possible, the parameters used to group computer systems with their likely competitors were defined in the following manner:

- **Small systems** typically support two to 16 users and cost between $10,000 and $100,000. The category includes machines termed 16-bit minicomputers, 16- and 32-bit supermicrocomputers and low-end versions of traditional 32-bit superminis and business systems.
- **Personal computers** are defined as single-user machines used primarily in a business setting. These machines are microprocessor-based and general-purpose in nature. They can be programmed in a high-level language and can connect with a variety of peripheral devices to suit users' needs.

For the most part, traditional home-type computers are not included in this classification, in order to limit the large number of PC offerings.

- **Workstations** are single-user systems used primarily for technical and engineering purposes.

These definitions are general guidelines and cannot be strictly applied in every case. In instances in which systems cannot be classified on the basis of these definitions, the editors have attempted to categorize in a manner consistent with common practice.

Similarly, many who evaluate systems look for a number that indicates how each computer handles a particular well-defined set of tasks.

In the absence of such numbers, the charts include millions of instructions per second — as either provided by the vendors or estimated by CW based on vendor claims — and memory and storage capacities, supplied by vendors in response to a questionnaire.

Workstations dust off after rough year's ride

BY BARBARA FRANCETT

During the last 12 months, the technical workstation arena has been marked by cataclysmic changes among the market leaders and subtle, evolutionary shifts in the market as a whole. In some cases, the effects of the upheavals were positive; in other cases, they leaned toward the negative. In a few instances, the impact is not yet clear. Only one thing is sure: The past is gone, and the playing field is now more level than ever.

This year, bright star Sun Microsystems, Inc. faltered, and a powerful new twin star — the merger of Hewlett-Packard Co. and Apollo Computer, Inc. — arose. New lights from vendors such as Digital Equipment Corp., Data General Corp., Mips Computer Systems, Inc. and Next, Inc. appeared in the competitive constellation.

WORKSTATIONS

Intergraph Corp., with its Clipper-based reduced instruction set computing (RISC) workstations, posted a strong performance, moving into the No. 5 slot ahead of Silicon Graphics, Inc., according to Framingham, Mass.-based International Data Corp. (IDC). Tektronix, Inc. gained a position among the top 10 workstation vendors for the first time.

At least one long shadow fell over the market — that of IBM. The company hinted not only at vast power and new enhancements to come for the RT workstation by the end of the year but also an expanded interest in the workstation market as a strategic product segment.

The price/performance wars reached new heights — or depths — as subsequent announcements from DEC, then Sun, then DEC again, countered one another with successively lower entry-level prices. HP and Silicon Graphics also cut prices. However, it appeared that connectivity and functionality might soon displace price/performance as a sparring point.

Undoubtedly the single most significant event of the last year was HP's $476.4 million acquisition of Apollo in April. The surprise sale rocked the industry and, according to some analysts, instantly vaulted HP into the No. 1 market share slot, displacing longtime leader Sun.

Analysts view the move as favorable for both companies, although not without pitfalls.

"It's a good fit for both companies," says Jim Hammons, manager of Technology Advisory Services at The Sierra Group, Inc., based in Tempe, Ariz. "Apollo had good products, innovative technology and some of the best networking protocols around. HP gained all that plus a significantly larger installed base. Apollo got HP's reputation for support and service, where before, they did not have the wherewithal to keep their accounts happy."

Others took a less sanguine view. "User concern and confusion over which product lines will be dropped and which ones will be supported are likely to translate into lost business for HP," notes Vicki Brown, director of systems research at IDC.

Melding two product lines will take a long time, points out Kathleen Hurley, workstation industry analyst at Dataquest, Inc. in San Jose, Calif. "Right now, they're supporting three architectures. That's hard to manage. Also, there's the issue of East Coast/West Coast mentalities. They need to blend their cultures, and they haven't done that yet," she says.

Indeed, HP posted a slight loss in third-quarter earnings. For the fiscal quarter ending July 31, profits were down 2.6%. Although HP attributed the drop to slow sales on the minicomputer side, analysts point the finger at an unruly product mix.

Nevertheless, the merger represented an irresistible trend in the workstation segment. The market is maturing, evolving from a proving ground for bright young start-ups with technological whizbang to a battleground for computer industry giants with broad product lines and marketing and manufacturing resources to spare.

"DEC and IBM sat out the major growth phases of the first few years. Now they'll come into the market with a full strategy of competing for market share with aggressive pricing," says George Weiss, program director of midrange systems at Gartner Group, Inc. in Stamford, Conn. "The market is large and can contribute significantly to a large-system company's revenue. As the competitive situation becomes more intense, it drives down prices. This puts more pressure on companies less equipped to provide a broad base of services."

Dimming Sun?

Such an evolution may well mean a continued dimming for Sun, which suffered setbacks this year. If bigger players HP/Apollo, DEC and IBM muscle in to grab most of the market, Sun may find itself taking a backseat for the first time since the technical workstation market boom began several years ago.

"Sun would like to see workstations become like PCs — low-cost and mass-produced for a mass market," Weiss says. "They'd like the Sparc architecture accepted as a standard. The downside is that they might give away the low end of the market to lower cost, higher volume manufacturers."

Moreover, "Sun could have a difficult time at the high end," Weiss continues. "They're not known for a high-performance product, whereas HP and DEC have the potential to exploit the high end. Unless Sun discovers new technology that significantly advances the state of the art, they'll have a tough time."

Sun, however, has already withstood several bad breaks and managerial miscalculations with little sign of slowing down

Continued on next page

Francett is a free-lance writer based in Bloomfield, N.J.

Workstation monthly

October: Steve Jobs announces that the Next computer is available to universities at $6,500. Silicon Graphics offers its high-end Iris Power series and the low-end 3-D Personal Iris.

November: Five semiconductor vendors form the Sparc Vendor Council to promote Sun's Sparc RISC architecture as an industry standard and give it some distance from Sun.

January: DEC announces three Vaxstations and a RISC-based, 14-MIPS workstation, the Decstation 3100. Sun-compatible vendor Solbourne Computer rolls out with the Series 4/600.

February: IBM hints that the RT — and AIX — will take on a more important role in its workstation strategy; however, no enhancements are expected before the fall. Mips Computer Systems enters the workstation arena by announcing the entry-level RS 2030 workstation based on the same processor as in DEC's Decstation 3100. Data General announces five RISC-based workstation models, based on Motorola's 88000 chip set.

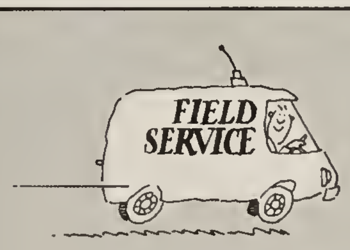
April: Sun's introduction of the 12.5-MIPS Sparcstation 1 is completely overshadowed by Hewlett-Packard's purchase of ailing Apollo Computer. Next announces it will sell its machines to businesses for $9,995 — a 35% increase over its cost to academics.

May: Sun persists in its efforts to spread the gospel according to Sparc and announces that Sparc-based PCs will be available from Toshiba.

June: A computer foul-up at Sun brings its business operations to a virtual standstill.

July: DEC intros the Decstation 2100, an entry-level RISC workstation, which it positions as a competitor to Sun's Sparcstation 1. HP announces it will license its RISC architecture.

August: Sun announces a fourth-quarter loss of $20.3 million. Stellar and Ardent announce their merger.



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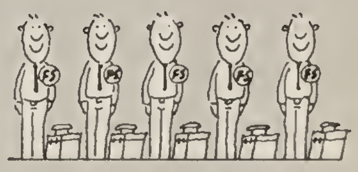

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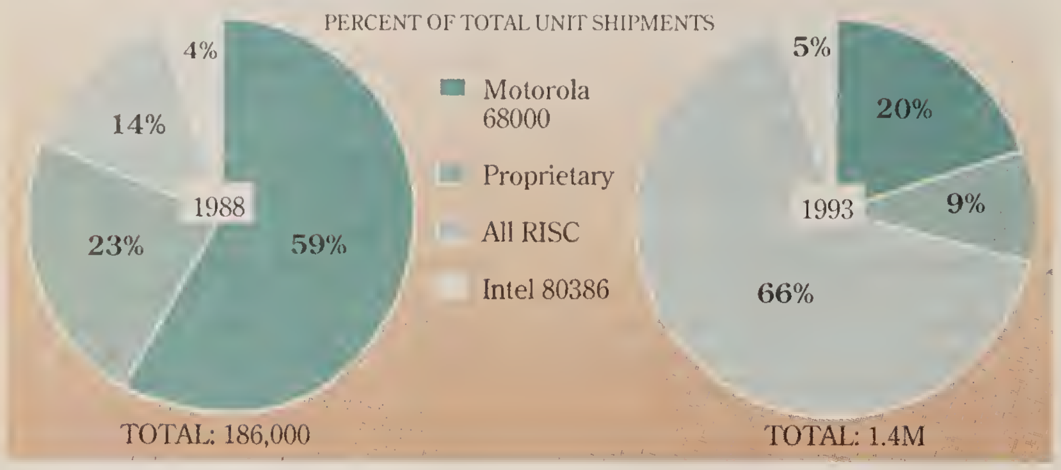
Balance of power

In the next five years, RISC-based workstations will see the greatest growth in the workstation market, which itself will grow 75%



SOURCE: INTERNATIONAL DATA CORP

CW CHART: DOREEN DAHLE

Workstations

FROM PREVIOUS PAGE

in its drive to establish the Scalable Processor Architecture (Sparc) RISC chip set as an industry standard and spread the workstation gospel to the commercial masses. In April, just as Sun was announcing its much-anticipated Sparcstation line — including the $8,995, 12.5-MIPS Sparcstation 1, — HP and Apollo dropped their merger bomb, effectively stealing Sun's thunder.

Then in June, Sun revealed that a major in-house computer snafu had stalled not only orders for new machines but outstanding orders for existing products. Sun Chief Executive Officer Scott McNealy conceded that in the aftermath, Sun could suffer its first losing quarter ever.

That prophecy fulfilled itself in August, when Sun reported a loss of $20.3 million for the fiscal fourth quarter ending June 30, despite an 18% increase in revenue from $365.1 million to $431.2 million. Moreover, the company says a return to profitability in the next quarter is uncertain.

Some analysts claim it was just a matter of time — Sun had been moving too fast for too long. Others view the setback as temporary.

"What happened with Sun didn't surprise us at all," Hammons says. "But it's not as bad as some analysts predict. Sun will find a way to survive and compete. They have strong products. They won't continue to be a dominant force as the market matures, but there will be plenty to go around."

Brown says she believes that, barring any major foul-ups, Sun will still be the revenue and market share leader through this year. "But for 1990 and beyond, Sun may lose share to DEC, HP/Apollo and, eventually, IBM," she adds.

Sun may need to broaden its scope still further to compete as those three leaders become more aggressive. "Workstations were originally designed for independent users, but now there's more of a need to share resources across the corporation," Hurley points out. "Companies like IBM, HP and DEC, with their wider product lines, can play more of a role. Sun needs to look at the corporate computing environment. So far, they've only addressed that in a small way."

Big guys' game

The growing interest of major computer vendors in the workstation market further emphasizes the segment's maturation. DEC has certainly set its sights on gaining a larger piece of that market and set out to prove it with a barrage of announcements in January and July.

January's introductions included DEC's first RISC-based machine, the 14-MIPS Decstation 3100, priced at $11,900. In July, DEC beefed up its RISC offerings with several additions and squarely targeted the Sparcstation 1 with the low-end 10.4-MIPS Decstation 2100, priced at $7,950.

"DEC considers Sun its major competitor," Brown says. "The real test of DEC's workstation success is in Unix-based workstations."

DEC's RISC workstations are based on chips from Mips Computer Systems. Not wanting to be left out, Mips introduced several new RISC-based machines in February, including an entry-level workstation, the 12-MIPS RS2030, priced at $17,000. Although not a major player, Mips Computer may be successful with its foray into the market by virtue of its relationship with DEC, according to some analysts.

DEC was not the only industry heavy hitter to take an aggressive crack at the workstation market. In February, Data General Corp. introduced the Aviion line, based on Motorola, Inc.'s 88000 RISC chip set. It included five workstations ranging from $7,450 to $14,995 and performing at 17 to 20 MIPS.

DG has "a chance," according to Patrice Johnson, director of sales and marketing in the computer markets division at IMS America Ltd. in Plymouth Meeting, Pa. "They're not really newcomers;

Continued on page 90

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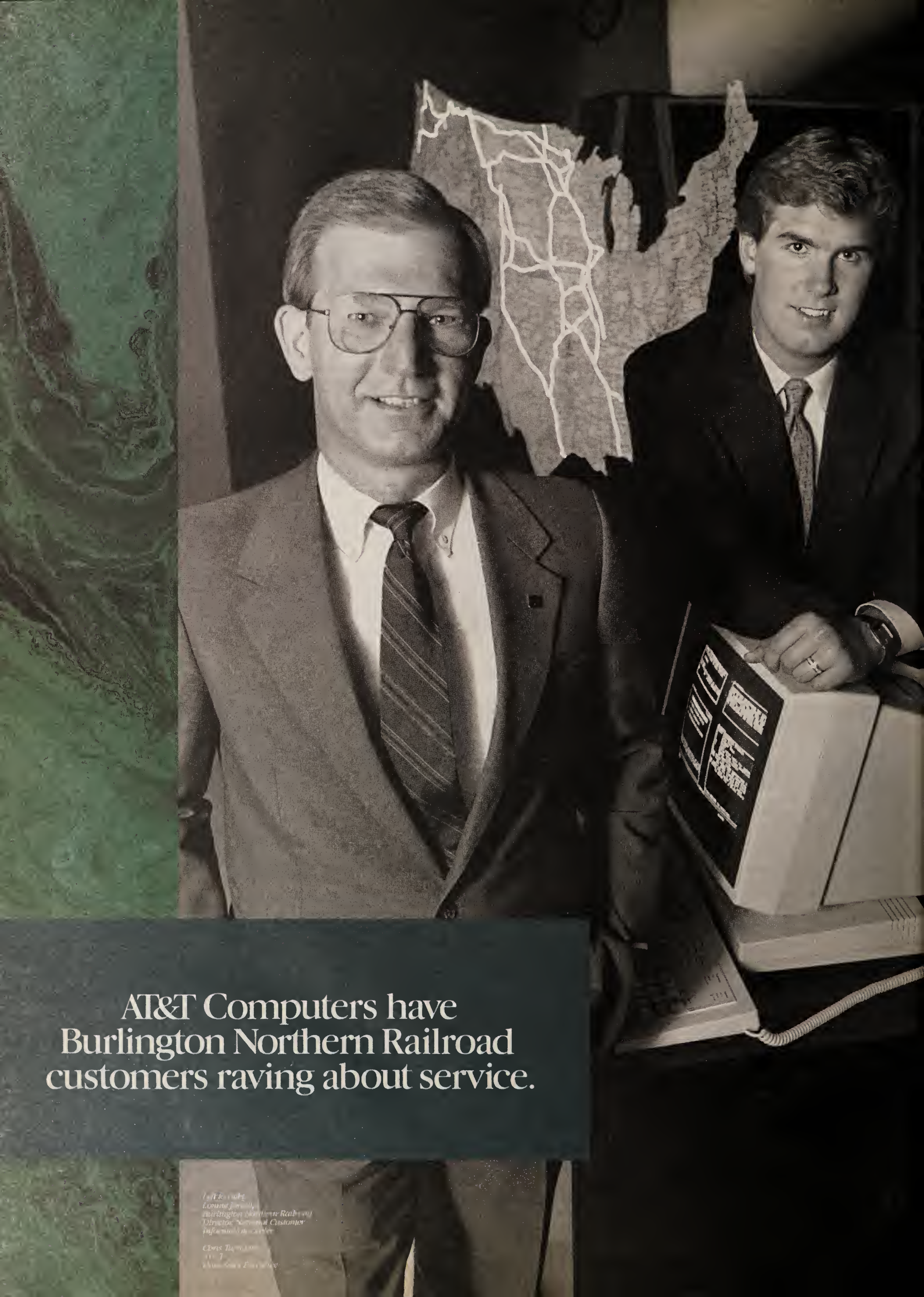
Workstations

COMPANY	PRODUCT	CPU	OPERATING SYSTEMS	MS-DOS SUPPORTED BY	PERFORMANCE (MIPS[1])	CO-PROCESSOR SUPPORT	MAIN MEMORY (megabytes)	NUMBER AND TYPE OF ADD-IN MEMORY SUPPORT	STORAGE (megabytes)	MASS STORAGE DISK CONTROLLER	USER INTERFACE SUPPORTED	TYPES OF NETWORKS SUPPORTED	COLOR OR MONOCHROME	GRAPHICS STANDARD SUPPORTED	PRICE
Advanced Logic Research **(800) 444-4257**	Power Flex 286	80286	DOS, OS/2, Unix, Xenix	Software and hardware co-processor	1.9	Math	1-16	NP	40	Embedded AT controller	None	Arcnet, Ethernet, Novell, Token-Ring	Both	EGA, VGA	$1,495
	Flex Cache SX 386Z	80386SX	DOS, OS/2, Unix, Xenix	Software and hardware co-processor	3.4	Math	512K-16M	NP	40	Embedded AT controller	None	Arcnet, Ethernet, Novell, Token-Ring	Both	EGA, VGA	$1,795-$4,199
	VIP SX386, 16 MHz	80386SX	DOS, OS/2, Unix, Xenix	Software and hardware co-processor	3.4	Math	512K-16M	NP	Up to 40	Embedded AT controller	None	Arcnet, Ethernet, Novell, Token-Ring	Both	EGA, VGA	$1,895-$3,695
	VIP 12286	80286, 12.5 MHz	DOS, OS/2, Unix, Xenix	Software and hardware co-processor	NP	NP	512K-5M	NP	Up to 40	Embedded AT controller	None	Arcnet, Ethernet, Novell, Token-Ring	Both	EGA, VGA	$1,795-$3,095
Agilis Corp. **(415) 962-9400**	Agilis System handheld workstation	80386	DOS, OS/2, Unix	NP	4	Math	1-8	1M-byte SIMMS	Up to 40	ST506	Windowing systems, touch screen	Ethernet	Monochrome	EGA	$8,000-$20,000
AT&T **(800) 247-1212**	6386/25 Models 311, 313, 314	80386	DOS, OS/2, Unix	NP	6.9	Math	4-40	32M-byte SIMMS	80-380	ESDI	Open Look, Windows 386, X Window	Ethernet, Starlan, TCP/IP, Token-Ring	Color	Super VGA	$6,695-$8,995
Concurrent Computer Corp. **(508) 692-6200**	6350, 6450	68030, 33 MHz	Real-time Unix	NP	7-14	Floating-point	8-120	8M, 16M, 32M bytes	142M-29G	ESDI, SCSI	NP	Ethernet, TCP/IP, Decnet, X.25	Color	X Window, Motif, GKS	$39,000-$250,000+
Control Data Corp. **(612) 853-8182**	Cyber 910-600 series	MIPS R2000/R3000	IRIX	Software co-processor	20-80	Floating-point	8-128	NP	182-10K	SCSI, SMD	X Window, News, 4sight	Ethernet, TCP/IP, Decnet	Color	Iris Graphics Library	$89,900-$144,900
	Cyber 910-500 series	MIPS R2000	IRIX	Software co-processor	7-14	Floating-point	8-144	NP	182-10K	SCSI, SMD	X Window, News, 4sight	Ethernet, TCP/IP, Decnet	Color	Iris Graphics Library	$34,900-$79,900
	Cyber 910-400 series	MIPS R2000/R3000	IRIX	Software co-processor	10-16	Floating-point	8-32	NP	182-1.9K	SCSI	X Window, News, 4sight	Ethernet, TCP/IP, Decnet	Color	Iris Graphics Library, Phigs	$16,500-$34,000
Datamedia Corp. **(603) 886-1570**	Netmate/XLS Model 386/20-00, 01, 08	80386	DOS, OS/2, Unix	Proprietary	4.7	Intel 80387	2-16	16-bit AT expansion slot, 32-bit memory expansion slot	1.44-80	SCSI	IBM-compatible keyboard	Netbios/OSI, Netware, PCSA, PCNFS, 3+, Decnet	Color	VGA, VGA+, VT340 Graphics	$6,395
	Netmate/SX Model 386SX/16-00, 01, 04	80386SX	DOS, OS/2, Unix	Proprietary	2.7	Intel 80387SX	2-8	16-bit AT slot	1.44-80	SCSI	IBM-compatible keyboard	Netbios/OSI, Netware, PCSA, PCNFS, 3+, Decnet	Color	VGA, VGA+, VT340 Graphics	$2,795
Data General Corp. **(800) 328-2436**	AVX 300	Motorola 88000, RISC	DG/UX	Software co-processor	17	Floating-point	4-28	Up to 7 4M-byte boards	179M-1.6G	SCSI	OSF/Motif	Ethernet 802.3, TCP/IP	Monochrome	Phigs, GKS	$7,450-$25,450
	AVX 300c	Motorola 88000, RISC	DG/UX	Software co-processor	17	Floating-point	8-28	Up to 7 4M-byte boards	179M-1.6G	SCSI	OSF/Motif	Ethernet 802.3, TCP/IP	Color	Phigs, GKS	$11,995-$26,995
	AVX 310	Motorola 88000, RISC	DG/UX	Software co-processor	20	Floating-point	8-28	Up to 7 4M-byte boards	179-1.6G	SCSI	OSF/Motif	Ethernet 802.3, TCP/IP	Monochrome	Phigs, GKS	$10,850-$25,850
	AVX 310c	Motorola 88000, RISC	DG/UX	Software co-processor	20	Floating-point	4-28	Up to 7 4M-byte boards	179M-1.6G	SCSI	OSF/Motif	Ethernet 802.3, TCP/IP	Color	Phigs, GKS	$14,995-$29,995
Digital Equipment Corp. **(800) 344-4825**	Decstation 2100	MIPS R2000	Ultrix 32	Software co-processor	10.4	FPU R2010	8-24	4M-byte increments	Up to 1.3G	SCSI	Decwindows	Decnet, Ethernet, LAT, TCP/IP	Both	GKS, Phigs, Regis, X Window	$7,950
	Decstation 3100 workstation	MIPS R2000	Ultrix 32	Software co-processor	1-14	FPU R2010	8-24	4M-byte increments	Up to 1.3G	SCSI	Decwindows	Decnet, Ethernet, LAT, TCP/IP	Both	GKS, Phigs, Regis, X Window	$11,900
	Vaxstation 3100	CMOS Microvax	VMS, Ultrix	Software co-processor	3-4	FPU	8-32	4M-, 12M-, 16M-byte increments	Up to 1.3G	SCSI	Decwindows	Decnet, Ethernet, LAT, TCP/IP	Both	GKS, Phigs, Regis	$7,900
	Vaxstation 3200	CMOS Microvax	VMS, Ultrix 32	Software co-processor	3-4	FPU	8-16	8M-byte increments	Up to 318	ST506	Decwindows	Decnet, Ethernet, LAT, TCP/IP	Both	GKS, Phigs, Regis, X Window	$21,138
	Vaxstation 3500	CMOS Microvax	VMS, Ultrix 32	Software co-processor	3-4	FPU	8	8M-byte increments	Up to 560	ST506	Decwindows, VIS	Decnet, Ethernet, LAT, TCP/IP	Both	GKS, Phigs, Regis, X Window	$52,818
	Vaxstation 3540	CMOS Microvax	VMS	NP	10	NP	8-48	8M- or 16M-byte increments	332M-1.3G	SCSI	Decwindows	Decnet, Ethernet, LAT, TCP/IP	Color	Phigs	$29,950
	Vaxstation 3520	Dual CMOS Microvax	VMS, Ultrix	NP	5	NP	8-64	8M- or 16M-byte increments	332M-1.3G	SCSI	Decwindows	Decnet, Ethernet, LAT, TCP/IP	Color	Phigs	$29,950
Hewlett-Packard Co., Apollo Division **(508) 256-6600**	Series 3000 personal workstation	68020, 12.5 MHz	Domain/OS	Software and hardware co-processor	1.5	Floating-point	4-8	NP	72-348	ESDI	Display manager, Motif, Domain XIII	Token-Ring, Ethernet	Both	Phigs, GKS	$5,490-$27,300
	Series 10000 visualization system	PRISM	Domain O/S	Software and hardware co-processor	22	Floating-point, math	8-128	NP	348M-5.2G	ESDI, SCSI	Display manager, Motif, Domain XIII	Token-Ring, Ethernet	Color	Phigs, GKS	$94,900-$228,400
	Series 10000 personal supercomputer	PRISM	Domain O/S	Software and hardware co-processor	22	Floating-point, math	8-128	NP	348M-5.2G	ESDI, SCSI	Display manager, OSF/Motif, Domain XIII	Token-Ring, Ethernet	Color	Phigs, GKS	$69,900-$257,400
	Series 3500 personal workstation	68030, 25 MHz	Domain/OS	Software and hardware co-processor	4	Floating-point	4-32	NP	155-697	ESDI	Display manager, Motif	Token-Ring, Ethernet	Both	Phigs, GKS	$8,490-$35,495
	Series 4500 personal workstation	68030, 33 MHz	Domain/OS	Software and hardware co-processor	7	Floating-point	8-32	NP	155-697	ESDI	Display manager, Motif, Domain XIII	Token-Ring, Ethernet	Both	Phigs, GKS	$19,990-$49,990

[1] Millions of instructions per second.

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Further product information is available from the vendors.



Left to right:
Leonard [illegible]
Burlington Northern Railway
Director National Customer
Information Center

Chris [illegible]
AT&T
[illegible] Executive

Denver, Colorado
May 2, 1989

The Burlington Northern National TrackSmart® Center is getting rave reviews from its customers. And AT&T's distributed networked computer solution behind it is getting rave reviews from Burlington Northern. Burlington Northern's Lonnie Jarrell tells AT&T's Chris Turnquist why AT&T Computers provide a better way to serve customers of the longest railroad in the country.

Lonnie: We want to be known for superior customer service. So we planned proactive shipment monitoring through a new customer service concept—the National TrackSmart Center.

Chris: And better customer service means getting information to your customers, in *their* reporting format, as soon as your reps have it.

Lonnie: Exactly. All we had to do was listen to our customers to understand their transportation information needs. That was plenty of inspiration. We knew then that we needed a system that would let our reps instantly locate cars and report shipment status to customers immediately.

Chris: I remember when your reps could only handle one customer at a time. They had to query the mainframe database car by car. And *then* manually record their findings and send them out. Now each rep can handle up to ten customers, right?

Lonnie: Absolutely, plus the rep has more time to serve his customers better. Now they save time by tracking every car from *one* CRT. The AT&T 6500 Multifunction Communications System gives them multi-window access to two synchronous sessions on our host, as well as async access to the TrackSmart application and AT&T Mail. Both TrackSmart and AT&T Mail run concurrently on the AT&T 3B2/1000 Computer. So the reps get information the second they need it.

Chris: And you're able to tap information easily.

Lonnie: Right. Because you molded AT&T distributed networked computing to fit the Burlington Northern, rather than the other way around. You provide it all—computer networking systems and communications expertise. Plus you blend it all together with other systems better than any company I've ever seen.

Chris: I understand one customer wrote a BN rep promising him an official company ID naming him their Assistant Transportation Manager.

Lonnie: That's true. But you know, if we're going to be a partner to our customers, we have to be a partner with vendors who can take us in that direction.

The Burlington Northern Computer Solution

THE CHALLENGE:

Differentiate Burlington Northern as a superior provider of customer service.

THE SOLUTION:

A distributed networked computer solution integrating Burlington Northern's applications with a UNIX® System V-based Informix® 4GL database management package. An AT&T 3B2/1000 Computer is the gateway to the host for TrackSmart information. The AT&T 6500 Multifunction Communications System provides host access with four window functions appearing on AT&T 6539 displays. AT&T Mail sets up an E-mail link between reps and customers; AT&T Mail with Private Message Exchange/TERM is a private E-mail link between Burlington Northern reps and TrackSmart.

THE RESULTS:

The system increases the number of customers a representative services tenfold. Some customers have indicated TrackSmart saves them at least four hours daily.

Call your AT&T Account Executive, AT&T Authorized Value Added Reseller or 1 800 247-1212, Ext. 527.

Your Computing Systems and Networking Solutions Company

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AT&T
Computer Systems

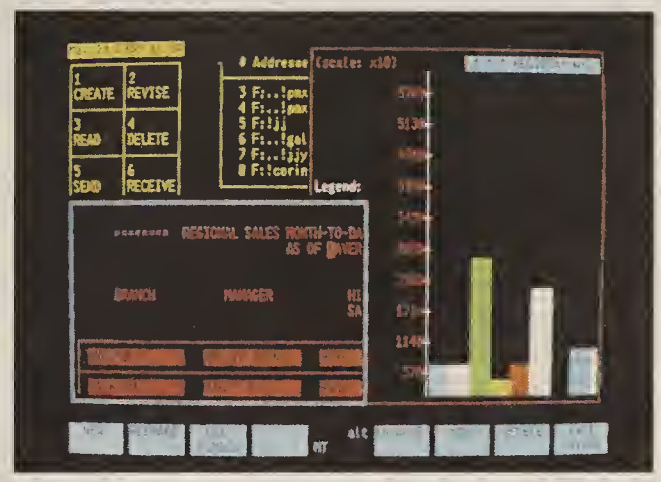
COMPANY	PRODUCT	CPU	OPERATING SYSTEMS	MS-DOS SUPPORTED BY	PERFORMANCE (MIPS')	CO-PROCESSOR SUPPORT	MAIN MEMORY (megabytes)	NUMBER AND TYPE OF ADD-IN MEMORY SUPPORT	STORAGE (megabytes)	MASS STORAGE DISK CONTROLLER	USER INTERFACE SUPPORTED	TYPES OF NETWORKS SUPPORTED	COLOR OR MONOCHROME	GRAPHICS STANDARD SUPPORTED	PRICE
Hewlett-Packard Co. **(800) 752-0900**	HP 9000 Models 340C+, 340CHX, 340SRX	68030, 16.7 MHz	HP-UX	Software and hardware co-processor	4	Floating-point	4-16	ECC RAM	40-500	SCSI, HP-IB	X Window, Motif	Ethernet, NS-ABPA, NFS, X.25	Color	Phigs+, CGM, CGI, GKS	$8,495-$15,000; $20,000; $25,000
	HP 9000 Models 360 C+, 360 CHX, 360 SRX, 360 Turbo SRX	68030, 25-MHz	HP-UX	Software and hardware co-processor	6	Floating-point	4-16	ECC RAM	40-500	SCSI, HP-IB	X Window, Motif	Ethernet, NS-ABPA, NFS, X25	Color	Phigs+, CGM, CGI, GKS	$14,900; $22,000; $30,000; $50,000
	HP 9000 Model 370C+, 370 CHX, 370 SRX, 370 Turbo SRX	68030, 33 MHz	HP-UX	Software and hardware co-processor	8	Floating-point	4-16	ECC RAM	40-500	SCSI, HP-IB	X Window, Motif	Ethernet, NS-ABPA, NFS, X25	Color	Phigs+, CGM, CGI, GKS	$28,000; $37,000; $41,900; $65,000
IBM **Contact sales office**	IBM RT-6151 Model 115	IBM RISC	AIX/RT	Software co-processor	4.4	Floating-point	4-16	4M-, 8M-byte CMOS memory	70-6840	SCSI	X Windows, AIX usability services	Ethernet, SNA TCP/IP, Token-Ring,	Both	Phigs, GSL, X Window	$12,551-$72,288
	IBM RT-6151 Model 130	IBM RISC	AIX/RT	Software co-processor	5.6	Floating-point	16-16	NA	114-6840	SCSI	X Window, AIX usability services	Ethernet, SNA, TCP/IP, Token-Ring,	Both	Phigs, GSL, X Window	$24,671-$72,000
	IBM RT-6150 Model 135	IBM RISC	AIX/RT	Software co-processor	5.6	Floating-point	16-16	NA	114-7460	SCSI	X Window, AIX usability services	Ethernet, SNA, TCP/IP, Token-Ring	Both	Phigs, GSL, X Window	$32,046-$92,330
	IBM RT-6150 Model B35	IBM RISC	AIX/RT	Software co-processor	5.6	Floating-point	16-16	NA	114-7460	SCSI	X Window, AIX usability services	Ethernet, SNA LU 6.2, TCP/IP, Token-Ring,	Both	Phigs, GSL, X Window	$51,165-$107,500
Intergraph, Corp. **(205) 772-2000**	Interpro 125	Intergraph Clipper C100	MS-DOS, Unix	Software co-processor	4	Floating-point, math co-processor	6-12	DRAM	156M-2.9G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$16,000-$21,000
	Interpro 225	Intergraph Clipper C100	MS-DOS, Unix	Software co-processor	5	Floating-point, math	8-16	DRAM	156M-2.9G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$26,000
	Interview 220	Intergraph Clipper C100	MS-DOS, Unix	Software co-processor	5	Floating-point, math	8-16	DRAM	156M-2.2G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$43,000-$47,000
	Interpro 340, Interact 340	Intergraph Clipper C100	MS-DOS, Unix	Software co-processor	5	Floating-point, math	16-80	DRAM	156M-2.9G; 156M-2.2G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$30,000; $60,000
	Interview 3050, Interact 3050	Intergraph Clipper C300	MS-DOS, Unix	Software co-processor	10	Floating-point, math	16-80	ECC	355M-2.9G, 355M-2.2G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet, NFS	Color	Phigs, Environ V, GKS	$64,000; $60,000
	Interpro 3050, 3070	Intergraph Clipper C300	MS-DOS, Unix	Software co-processor	10	Floating-point, math	16-80	ECC	355M-2.9G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$45,000; $56,000
	Interpro 3055, 3075	Intergraph Clipper C300	MS-DOS, Unix	Software co-processor	10	Floating-point, math	16-112	ECC	670M-2.9G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$54,000; $65,000
	Interpro 3280	Intergraph Clipper C300	MS-DOS, Unix	Software co-processor	14	Floating-point, math	16-80	ECC	355M-2.9G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet NFS	Color	Phigs, Environ V, GKS	$62,000
	Interpro 3285	Intergraph Clipper C300	MS-DOS, Unix	Software co-processor	14	Floating-point, math	16-112	ECC	670M-2.9G	SCSI	X Window, Motif, Envision V	Ethernet, XNS, TCP/IP, Decnet, NFS	Color	Phigs, Environ V, GKS	$71,000
Mips Computer Systems, Inc. **(408) 720-1700**	RS2030	NP	Unix	NP	12	NP	8-16	NP	NP	NP	NP	NP	NP	NP	$17,000
NCR Corp. **(800) 544-3333**	NCR PC925	80386	MS-DOS, OS/2, Xenix, Unix	NP	7	Floating-point, math	4-8	4.8M-byte boards	60-327	SCSI	NP	OS/2 LAN Manager, Novell, PC LAN	NP	VGA	$6,895-$11,595
	NCR PC920	80386-20	MS-DOS, OS/2, Xenix, Unix	NP	5	Floating-point, math	2-26	4.8M-byte boards	44-115	NP	NP	OS/2 LAN Manager, Novell, PC LAN	NP	VGA	$4,695-$7,795
Next, Inc. **(415) 366-0900**	Next Computer System	68030	Unix derivation	NP	NP	Floating-point	8-16	NP	250-660	Optical drive, SCSI	NP	Ethernet	Monochrome	Postscript	$6,500-$10,000
Opus Systems **(408) 446-2110**	Personal Mainframe/8000-25	88000, 25-MHz	Unix System V	Hardware co-processor	21	Floating-point	4-24	Four 20M-byte cards	40-760	ESDI, SCSI	Motif	Ethernet	NP	X Window	$12,495-$29,495
	Personal Mainframe/8000-20	88000, 20-MHz	Unix Sytem V	Hardware co-processor	17	Floating-point	4-24	Four 20M-byte cards	40-760	ESDI, SCSI	Motif	Ethernet	Color	X Window 11.3	$9,995-$26,995
Prime Computer, Inc. **(800) 343-2540**	Caddstation Model 33C-001	68020	Unix 4.2 BSD	NP	3	Floating-point	4-24	4M-, 8M-byte boards	510	SCSI	NP	Ethernet, TCP/IP	Color	Phigs+	$14,450
	Caddstation Model 34C/0008	68020	SunOS	NP	4	Floating-point	8-32	4M-, 8M-byte boards	380	SCSI	NP	Ethernet, TCP/IP	Color	Phigs+	$38,900
Raster Technologies, an Alliant Company **(508) 486-4950**	Sun/GX	Sun-3/200, Sun-4/200	SunOS	NP	4, 10	Floating-point	8-128	NP	170M-2.2G	NP	NP	Ethernet, MAP, TOP	Color	NP	$72,000-$150,000
Silicon Graphics, Inc. **(415) 960-1980**	IRIS 4D Series	R2000, R3000	Unix 3	Software co-processor	10-160	Floating-point	8-128	NP	170M-9.6G	ESDI, SCSI	Workspace	Ethernet, Decnet, 3270, 5080	Color	Phigs, GL	$12,900-$180,000
Sony Microsystems Co. **(415) 965-4492**	News 711	68020, 16.67 MHz	Unix BSD 4.3	NP	2.3	Floating-point	4	NP	NP	Diskless	X Window	Ethernet, TCP/IP, NSF	Monochrome	CGI	$3,700-$3,700
	News 721	68020, 20 MHz	Unix BSD 4.3	NP	2.8	Floating-point	4-8	4M-byte upgrade	NP	NP	X Window	Ethernet, TCP/IP, NSF	Color	CGI	$7,500-$11,500
	News 1720, 1750	68030, 25 MHz	Unix BSD 4.3	NP	4.3	Floating-point	4-32	NP, 4M-byte upgrade	156M-3.2G, 286M-3.3G	SCSI	X Window	Ethernet, TCP/IP, NSF	Color	CGI	$11,500-$22,800; $15,000,$26,800
	News 1850	68030 25 MHz	Unix BSD 4.3, News OS	NP	5.3	Floating-point	16-32	NP	286M-3.3G	SCSI	X Window	Ethernet, TCP/IP, NSF	Color	CGI	$28,000-$39,300
	News 1930	68030 25 MHz	Unix BSD 4.3	NP	5.3	Floating-point	16-32	16M-byte upgrade	286M-3.3G	SCSI	X Window	Ethernet, TCP/IP, NSF	Color	CGI	$47,000-$58,300
Sun Microsystems, Inc. **(415) 960-1300**	Sun-3/80	68030	SunOS	Software co-processor	3	Floating-point	4-16	4M-byte SIMMS	104M-1.1G	SCSI	Sunview, Openlook	Token-Ring, NFS, LAN	Both	CGI, CORE, Sunphigs, Sun GKS	$5,995
	Sparcstation 1	Sparc	SunOS	Software co-processor	12.5	Floating-point	8-16	1M-byte SIMMS	104M-1.1G	SCSI	Sunview, Openlook	Token-Ring, NFS, LAN	Both	CGI, CORE, Sunphigs, SunGKS	$8,995

The AT&T 3B2/1000 Computer. It's not just working on the railroad.

Whether you're into networking, office automation, software development, or anything in between, one thing is certain. You've just found the ultimate in distributed networked computing.

And Burlington Northern Railroad would agree. After all, they brought the AT&T 3B2/1000 Computer on board as the primary element of their National Tracksmart® Center. It was their ticket to better customer service.

First, it offered the best integrated systems solution. Second, was its value over time. You can actually add from 20 to 100 or more users, keeping your price-per-user cost relatively consistent. And it's field-upgradable. So you can move up to new models or enhance existing ones without major disruptions in the environment. It's this kind of buy-now-and-add-later strategy your business can grow with.



The AT&T 3B2/1000 and 615 CMT provide simultaneous interaction with multiple applications.

For instance, you can quickly and affordably go from 5 to 16 MIPS with multiple processing elements to more efficiently balance the system workload. And put distributed departmental computing a lot closer to your frontline users. What's more, you can add up to a full 15.9 GB of storage. As well as up to 64 MB of memory—perfect for massive database applications, file sharing and networking demands.

The AT&T 3B2/1000 Computer and AT&T 615 Color Multi-tasking Terminal.

And speaking of networking, the 3B2 gives you quite a long list of options. It can provide a bridge between open and closed computing platforms from a variety of vendors. Not only to help preserve your system investments, but strengthen them as well. Plus, it's great in wide-area connectivity environments. Or when you rely on heavy background processing like database management. Or *anytime* when accessing huge amounts of data or high availability is essential.

Now add the new Release 3.2.2 of UNIX® System V to the 3B2 and watch operating system performance soar. Together, they too protect investments. And they give you applications portability—just two more examples of the 3B2's price-performance superiority.

But keep in mind that it's not just the 3B2 that won over the country's longest railroad and its customers. It's the company behind it. So if you also can't afford to compromise on performance, price, compatibility or service, choose the AT&T 3B2/1000 Computer. And choose a whole dimension in departmental computing.

Call your AT&T Account Executive, AT&T Authorized Value-Added Reseller, or 1 800 247-1212, Ext. 536.

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AT&T
Computer Systems

COMPANY	PRODUCT	CPU	OPERATING SYSTEMS	MS-DOS SUPPORTED BY	PERFORMANCE (MIPS¹)	CO-PROCESSOR SUPPORT	MAIN MEMORY (megabytes)	NUMBER AND TYPE OF ADD-IN MEMORY SUPPORT	STORAGE (megabytes)	MASS STORAGE DISK CONTROLLER	USER INTERFACE SUPPORTED	TYPES OF NETWORKS SUPPORTED	COLOR OR MONOCHROME	GRAPHICS STANDARD SUPPORTED	PRICE
Sun Microsystems, Inc. **(415) 960-1300**	Sparcstation 370	Sparc	SunOS	Software co-processor	16	Floating-point	8-56	1M-byte SIMMS	1.3G-5.5G	ESDI, SCSI	Sunview, Openlook	Token-Ring, NFS, LAN	Both	CGI, CORE, Sunphigs, Sun GKS	$40,900
	Sun-3/470	68030	SunOS	Software co-processor	7	Floating-point	8-128	256K-, 1M-byte ECC	1.3G-5.5G	ESDI, SCSI	Sunview, Openlook	Token-Ring, NFS, LAN	Both	CGI, CORE, Sunphigs, Sun GKS	$40,900
	Sparcstation 330	Sparc	SunOS	Software co-processor	16	Floating-point	8-40	1M-byte SIMMS	327M-1.3G	SCSI	Sunview, Openlook	Token-Ring, NFS, LAN	Both	CGI, CORE, Sunphigs, Sun GKS	$29,900
	Sun 386I/150	80386, 20 MHz	SunOS, MS-DOS	Hardware co-processor	3	Floating-point	4-16	4M-, 8M-byte boards	91-155	SCSI	Sunview, XII/News	Ethernet, NFS, TCP/IP	Both	VGA, EGA, MDA, CGA	$8,990-$18,990
Symbolics, Inc. **(617) 221-1000**	Ivory	NP	Genera	Software co-processor	NP	Floating-point	2-4	2M, 4M, 8M bytes	NP	ESDI	NP	Decnet, TCP/IP, SNA 3270	NP	NP	$64,900
Tektronix, Inc. **(800) 225-5434**	4324, 4325 2D Graphics Workstation	68020, 20 MHz	Utek, Unix	Software co-processor	2.5	Graphics ASIC	4-12	Up to 8M bytes	86-600	SCSI	Touchscreen, mouse, tablets	Ethernet, TCP/IP, NFS, TDEnet	Color	EGA, Phigs, Plot 10 GKS	$19,950-$26,950; $22.950-29,950
	4335, 4336 3D Graphics Workstation	68020, 20 MHz	Utek, Unix	Software co-processor	2.5	Graphics ASIC	4-12	Up to 52M bytes	86-600	SCSI	Touchscreen, mouse, tablets	Ethernet, TCP/IP, NFS, TDEnet	Color	EGA, Phigs, Plot 10, GKS	$28,500-$35,500; $38,500-$45,500
	4337 3D Graphics Workstation	68020, 20 MHz	Utek, Unix	Software co-processor	2.5	Graphics ASIC	4-12	Up to 52M bytes	86-600	SCSI	Touchscreen, mouse, tablets	Ethernet, TCP/IP, NFS, TDEnet	Color	EGA, Phigs, Plot 10, GKS	$42,500-$49,500
	XD88/30 3D Graphics Superworkstation	Motorola 88100	UtekV	Software co-processor	17	Floating-point, graphics ASIC	8-176	Up to 52M bytes	156M-3.6G	SCSI	Touchscreen, mouse, tablets, trackball	Ethernet, TCP/IP, NFS, Decnet	Color	Phigs, EGA, Plot 10, GKS, XI1	$34,950-$56,450
	XD88/20 2D Graphics Superworkstation	Motorola 88100	UtekV	Software co-processor	17	Graphics ASIC	8-176	Up to 8M bytes	156M-3.6G	SCSI	Touchscreen, mouse, tablets, thumbwheels	Ethernet, TCP/IP, NFS, RFS, Decnet	Color	Phigs, EGA, Plot 10, GKS, XII	$29,950-$33,950
Unisys Corp. **(303) 449-1138**	Model 1450 CAD/CAM Workstation	68020	Unix System V	NP	3	Floating-point	4-10	NP	142	NP	NP	Ethernet, TCP/IP	NP	NP	$32,600

Workstations

CONTINUED FROM PAGE 84

they're just extending their product line down."

In the flurry of announcements and counter-announcements, one vendor was conspicuous in its absence: IBM. IBM has hinted repeatedly that it has more in mind for the workstation market than the current, oft-maligned RT, but it isn't saying much more.

Rumor stew

In mid-August, in response to industry rumors — largely fueled by IBM's own oblique comments in February and May — the vendor announced that it was developing a low-cost, 20-MIPS workstation for introduction later this year or early next year. Further details, however, were not forthcoming.

Even so, IBM has a long way to go to make a significant impact. "Even if IBM introduces a barn-burner RT replacement, it will take them 18 months or so to catch up," IDC's Brown points out.

"I think IBM has a very good product in the works," Hammons says. "However, I think it will be surprised by the strength of other vendors in the market and their ability to react."

Serious interest in the workstation market is also being shown by the entry of Far East vendors. In January, Matsushita-financed Solbourne Computer, Inc. announced the arrival of the first Sun-compatible workstations, the Series 4/600 deskside models, and followed up in March with the Series 4/500 desktop models. These are Sun-4 compatibles, priced from $19,400.

In May, Sun announced that Toshiba Corp. would begin to manufacture Sparc-based machines.

In July and August, HP announced that it would license its RISC technology, Precision Architecture, to Hitachi Ltd. and Samsung Electronics Co. "They're taking advantage of each other's skills," Hurley says. "HP is looking for production expertise from the Japanese, and the Japanese get technical expertise from HP."

RISC onslaught

Not all the shifts in the workstations market were in the business end. The onslaught of RISC-based workstations signaled not only the long-expected if long-debated fundamental shift from complex instruction set computing to RISC but also the eventual extinction of Motorola 68000-based machines.

"The 68000 will disappear in four to five years," Gartner Group's Weiss predicts. "The 386 and 486 chips compete for the parts of the technical workstation market based on cost/performance."

That eventuality didn't stop Steve Jobs from introducing the 68030-based Next, Inc. computer last October. Generally viewed as a good product in a masterwork of packaging, the Next machine is a dark horse and is not expected to make much of a dent in the workstation market.

"There's nothing there that's unable to be duplicated by any other vendor," Weiss says. "It doesn't open any new technology window.

Originally, Jobs insisted that the Next computer would be sold only to universities, at a price of $6,500. But in April, he changed his tune, announcing that Businessland, Inc. would sell Next computers to the commercial market for $9,995.

Next's choice of a retail outlet for its computers is certain to be watched with interest. However, it is not a move likely to be emulated soon by most workstation vendors, although Sun has toyed with the idea for some time. "It's a great decision — if it works," IMS America's Johnson notes.

"I have to question if [going with a retailer] was the only option available to Next," Hammons says. "There's a reason why no other workstation vendors are doing that."

> "I THINK IBM has a very good product in the works. However, I think it will be surprised by the strength of other vendors in the market and their ability to react."
>
> JIM HAMMONS
> SIERRA GROUP

A crossover of workstations to the commercial world, except for rare exceptions in the financial community, still has a long way to go, largely blocked by a lack of commercial software for them.

Sun, however, the greatest proponent of commercial crossover, recently took steps to get the ball rolling a little faster. In July, it signed a deal with Lotus Development Corp. to develop products for its workstations.

Brown is bullish on workstations' acceptance in the commercial world during the next few years. "Both DEC and Sun cite commercial applications as a strategic goal," she says. She cites several factors in their favor, including imminent software availability and portability, lower prices and the convergence of many Unix versions to two, that of the Open Software Foundation and Unix International, Inc.

At the other end of the workstation spectrum, Silicon Graphics continued to shore up its domination of the high-end three-dimensional graphics niche. In October, it added to its Iris four-dimensional line the Power series of six high-end systems and the entry-level Personal Iris, at a little less than $16,000. In July, the vendor added another member to the Power series and reduced the price of the Personal Iris to $13,500.

Quiet aggressors

Graphics supercomputer makers Ardent Computer Corp. and Stellar Computer, Inc., which garnered so much media attention last year, have been quiet but busy.

"There's a great love of technology at the high end, but that doesn't always translate into user embracement," Weiss says. "Ardent and Stellar are marketing aggressively, but they need to come down in price."

The Aug. 30 announcement of a merger between the two companies, now known as Stardent, Inc., may also be a joint realization that the niche wasn't big enough to ultimately support both.

The events of the past year reveal major changes under way for workstation vendors. "A shift is beginning away from MIPS to added features and functions," Weiss says. "Price is no longer as big an issue," Hurley adds. "Interoperability, ease of use and support issues are important to users now."

The workstation segment will grow steadily but not enough to support all everyone, Hammons warns, adding, "Those who can't adapt to standards and who ignore the need for connectivity will get hurt." •

Three forces govern small-systems market

BY PETER S. SCHAY

Although the small-systems market has rebounded in the last year, the good fortune was by no means universally shared.

IBM's Application System/400 — with half of the more than 50,000 shipped falling into the small-systems category — paced the market, boosting IBM's small-systems revenue a whopping 36%. Digital Equipment Corp. held onto the No. 2 slot in the small-systems business, showing disappointing growth in spite of a flood of new products. Hewlett-Packard Co. also benefited, as its reduced instruction set computing (RISC) HP 3000 Models 925 and 835 systems kicked into high gear.

SMALL SYSTEMS

The other big names in small systems, including Unisys Corp., NCR Corp., Wang Laboratories, Inc., Prime Computer, Inc. and Data General Corp., did not fare as well, however, with Wang and DG actually showing negative growth.

These changes illustrate the convergence of the small-systems market around three centers of gravity: IBM, DEC and Unix. This convergence enables — if not requires — users to view the selection of small systems in terms of architectures, not products.

In the IBM environment, this means Systems Application Architecture, whether on an AS/400 or an IBM 9370 running VM. In the DEC environment, this means Microvaxes running VMS today, with Network Application Support (NAS) paving the way for integration of RISC-based DEC systems in the future.

Most important, in the Unix environment, it means vendor-independent standards such as the X/Open Common Application Environment, rather than a particular implementation base such as AT&T's Unix System V, backed by Unix International, Inc. (UII), or Open Software Foundation's OSF/1 implementation.

Slow to innovate

Recognizing this, users are becoming increasingly reluctant to introduce new proprietary architectures to their organizations. This limits vendors' ability to grow beyond their current customer bases with existing proprietary architectures, forcing them instead to introduce Unix products for new customers and reinforce the Unix trend. Vendors such as NCR Corp., Unisys and HP, already shipping Unix systems, are benefiting from this trend.

With more users seeking out Unix, not even DEC and IBM are immune, as witnessed by the RISC-based, Unix-only Decsystem 3100 and 5400 and the imminent IBM RT multiuser configuration. Nonetheless, the majority of IBM and DEC small-systems customers are likely to continue buying the companies' proprietary systems well into the 1990s.

While the AS/400 turned in a stellar performance on the strength of pent-up demand from System/36 users, IBM moved to reinforce its disappointing 9370 product line with the April introduction of the IBM 9373 Model 25, priced from $26,250.

Offering significantly higher performance than the Models 20 and 40 it replaced, the Model 25 improved the 9370's price/performance relative to competitive Microvax and Unix systems. IBM also enhanced the performance of the 9370 Model 50 by 26%, providing free upgrades for previously installed Model 50s in the bargain.

IBM also countered competitive benchmark claims from DEC and HP by publishing audited Debit-Credit results in October and its RAMP-C (Requirements Approach to Measuring Performance in Cobol) proprietary benchmark results in July. The latter report includes a technical description of RAMP-C to help establish its credibility.

While DEC may have disappointed Wall Street, it certainly did right by small-systems users. It introduced the Microvax 3300 and 3400 in October, Decsystem 3100 in March, Microvax 3800 and 3900 in April and Microvax 3100 and Decsystem 5400 in July. With prices plunging as low as $1,500 per millions of instruction per second (MIPS), DEC signaled the industry that the era of DEC maintaining a price umbrella for small systems — as IBM does for large systems — was over.

DEC also added fuel to the Unix fire, as the new Decsystems, based on the Mips Computer Systems, Inc. RISC chips, run only Ultrix, DEC's version of Unix, not VMS. In doing so, DEC undermined its "one architecture, one operating system" marketing message, highlighting the importance of its NAS strategy for the future integration of VMS and Ultrix

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Schay is vice-president of small computer systems at Gartner Group, Inc. in Stamford, Conn.

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> THE IDEA OF price/performance wars between IBM and DEC in the Unix market is enough to give financially weaker vendors nightmares.

Not surprisingly, Unix announcements continued unabated from the year before, as performance levels offered by commercial microprocessors from Intel Corp., Motorola, Inc. and Mips Computer rose toward the 20-MIPS mark.

Unisys, which has targeted the Unix market as a long-term growth opportunity to offset its softening large-system business, introduced an entry-level Intel 80386-based U6000 Model 30, priced from $11,500. The Unisys Network Computing Group — formerly called Convergent Technologies — also filled in its Motorola 68020-based S series with the S/480.

Likewise, NCR Corp., which pioneered the entry of major computer vendors into the small Unix system business with its Tower product line, just introduced the Motorola 68030-based Tower 32/700 for 32 to 64 users. Coming up from the PC space, Zenith introduced the Z-1000, a multiprocessor Unix system containing up to six 386s, with prices starting around $20,000.

It was DEC and DG, however, which set the pace in small-system price/performance positioning, using RISC-based products. Although DG's Motorola 88000-based Aviion products are currently configured as workstations, not small systems, DG has made no secret of its intent to phase in the Aviion family as its new mainstream product line. With Aviion server prices starting at less than $600 per MIPS, DG seems to be well positioned on a price/performance basis.

Looking ahead, the key question is how aggressively IBM will price the multiuser configurations of the long-rumored 30 MIPS replacement for the RT. Just the idea of Unix price/performance wars between IBM and DEC is enough to give financially weaker vendors nightmares.

Vendors tend to their own

While RISC and Unix may be the wave of the future, vendors by no means have ignored their existing proprietary system user bases.

Unisys brought its proprietary A series mainframe architecture and MCP/AS operating system down into the small-systems space with the introduction of the Micro A. Its $20,365 entry price makes it very attractive to existing A series customers looking at development systems or distributed applications. But analysts doubted whether the Micro A would attract much interest outside the Unisys customer base.

Meanwhile, Bull H. N. Information Systems, Inc., looking to expand its proprietary DPS 7000 presence from Europe to the U.S., introduced the DPS 7000/200 series, starting with the DPS 7000/230 at $46,000.

Among traditional small-systems vendors, Prime introduced the 2850, an entry-level member of its proprietary 50 series. Supported by the Primos operating system and the Prime Information Pick-based database/4GL, prices for the 2850 start at $46,660. Unfortunately for Prime, its long-running battle to prevent a takeover by MAI Basic Four, Inc. seemed to capture more attention than its products.

DG continued to emphasize price/performance for its MV users with the introduction of the 3 MIPS MV/15000S Model 8, which bundles disk and tape drives in its $90,700 base price. DG has pledged continued support for its proprietary MV customer base, as it has supported the Nova base, while it shifts its primary focus to the RISC-based Aviion line for future growth.

Where've you Biin?

Arguably, the most innovative new machine is the Biin 20, the outgrowth of a joint venture between Siemens AG and Intel. Similar to RISC machines, the Biin 20 executes many instructions in a single cycle, but the overall architecture is more reminiscent of the highly microprogrammed AS/400.

The Biin operating system, written in Ada, is object-oriented and provides a high degree of software fault tolerance, while the Biin 20's hardware organization provides Stratus-like hardware fault tolerance. Although the internal design of the operating system is entirely new, the application programming interface complies with Posix, enabling users to view it as a fault-tolerant Unix. It remains to be seen how well the market will accept Biin, but the product looks like a winner, and Siemens and Intel have deep enough pockets for a serious try.

Although the AS/400 led the rebound in the small-systems market, user attention continues to shift to Unix and RISC, two factors that will come to dominate the small-systems market. IBM and DEC will continue to do well, as will Unix system vendors if they stay up on the price/performance curve. However, others, such as DG and Wang, will have to pay close attention to what is going on around them if they are to survive. •

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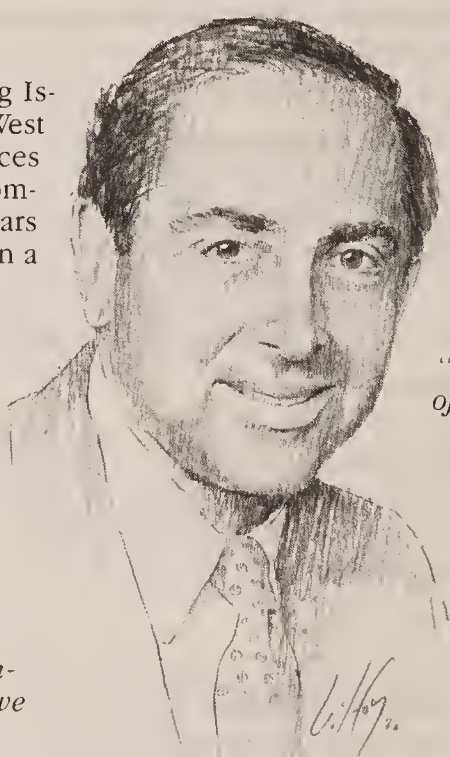

Cornell Computer Corp., based in Long Island, N.Y., with 15 offices in the East, West and Southwest, provides consultant services to the nation's MIS departments. The company also specializes in training seminars and courses and software maintenance on a 24-hours-a-day basis.

But Cornell considers the quality of its consultants to be the company's greatest asset, says Chairman John Tutunjian. That's why, he notes, when it comes to recruiting consultants, Cornell turns to *Computerworld*'s Computer Careers pages.

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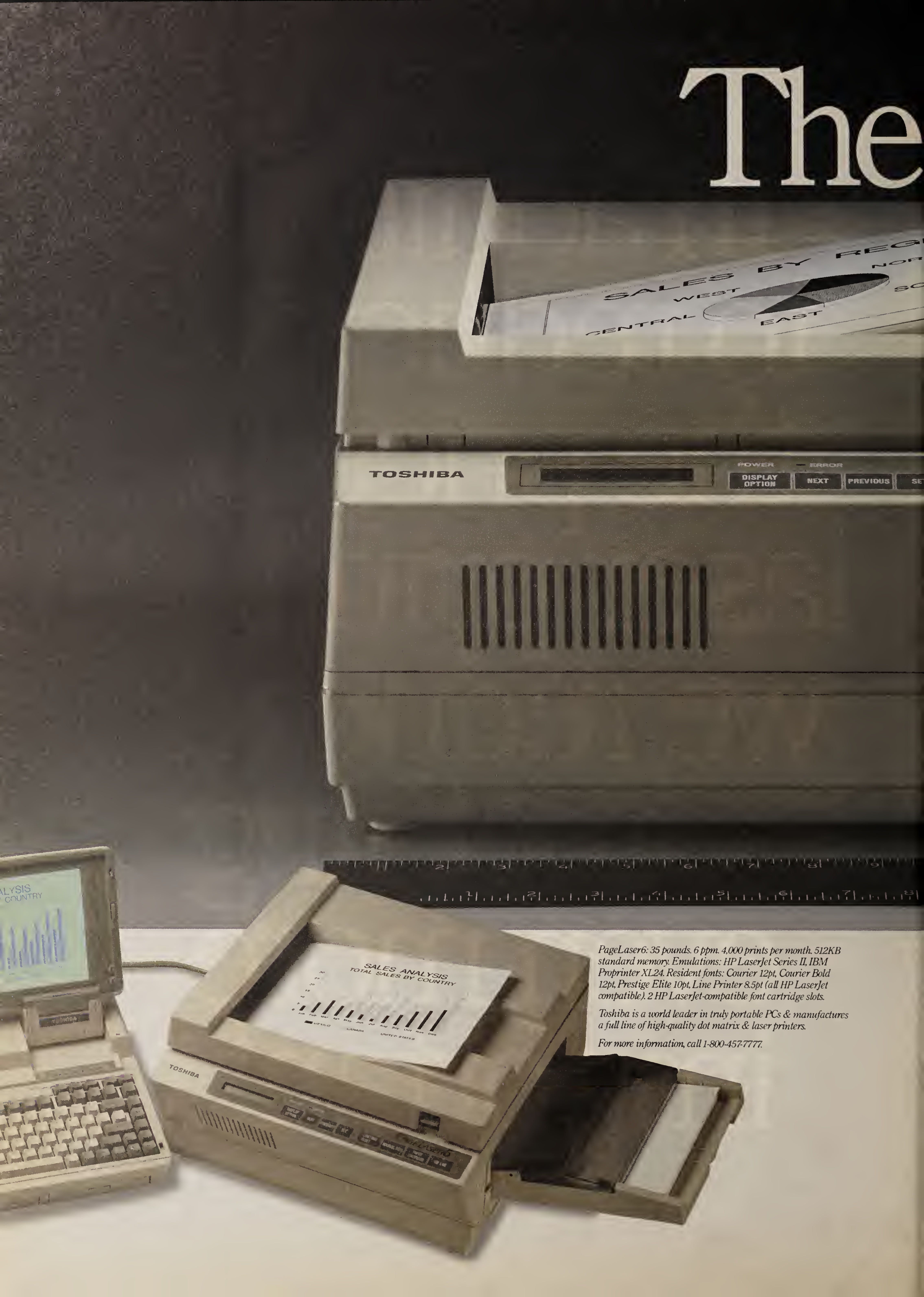

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Advanced Logic Research, Inc. **(800) 444-4257**	Microflex 7000	NP	NP	DP, SE	NP	6.005	NP	2-16	NP	NP	2	NP	MS-DOS, OS/2, Unix, Xenix	100	70 per server	64	$9,499 with 2M-byte RAM, 120M-byte disk, 1.44M-byte floppy, eight slots	Dealer, VAR
	Flex Cache 33/386	NP	NP	DP, SE	NP	8.154	NP	2-16	NP	NP	2	AT	MS-DOS, OS/2, Unix, Xenix	100	70 per server	64	$9,990 with 2M-byte RAM, 150M-byte disk, 1.2M-byte floppy, eight slots	Dealer, VAR
	Flex Cache 33/386Z	NP	NP	DP, SE	NP	7.954	NP	1-15	NP	NP	2	AT	MS-DOS, OS/2, Unix, Xenix	100	70 per server	32	$3,995 with 1M-byte RAM, 1.44M-byte floppy, seven slots	Dealer, VAR
	Flex Cache 25386	NP	NP	DP, SE	NP	6.071	NP	4-16	NP	NP	2	AT	MS-DOS, OS/2, Unix, Xenix	100	70 per server	32	$8,499 with 4M-byte RAM, 150M-byte disk, 1.2M-byte floppy, eight slots	Dealer, VAR
Altos Computer Systems **(408) 946-6700**	Altos 386 Series 500	NP	NP	DP, OA	NP	3.5	NP	2-16	5	40-200	2-18	80386	Altos System V/386	18	1-8	32	NP	OEM, dealer, VAR
	Altos 386 Series 2000 Model 20	NP	NP	DP, OA	NP	3.8	NP	4-16	10	80-380	Up to 20	80386	Altos System V/386	122	21-64	32	NP	OEM, dealer, VAR
	Altos 386 Series 1000 Model 25	NP	NP	DP, OA	NP	4	NP	4-24	10	90-700	8	80386	Altos System V/386	77	9-20	32	NP	OEM, dealer, VAR
	Altos 386 Series 1000 Model 33	NP	NP	DP, OA	NP	4.5	NP	4-24	10	190-700	8	80386	Altos System V/386	77	9-20	32	NP	OEM, dealer, VAR
	Altos 68X Series 030	NP	NP	DP, OA	NP	NP	NP	4-16	10	80-380	Up to 20	80386	Pick	122	21-64	32	NP	OEM, dealer, VAR
Applied Digital Data Systems **(516) 231-5400 Ext. 593**	Mentor 6000 Models 4/16, 4/25	Oct. 1986	1,400	DP, OA	AS/400, Microvax	NP	NP	2-16	4.8	14G	16-254	CISC	Mentor O/S	254	60	32	$35,500 with 2M-byte memory, 140M-byte disk, 60M-byte cartridge tape, 16 ports	VAR
	Mentor 6000 Models 2/16, 2/25	Feb. 1987	1,200	DP, OA	AS/400, Microvax	NP	NP	2-8	4.8	1.1G	8-128	CISC	Mentor O/S	128	30	32	$28,000 with 2M-byte memory, 140M-byte disk, 60M-byte cartridge tape, eight ports	VAR
Arix Corp. **(408) 432-1200**	Arix 850, 875	Nov. 1984	2,549	DP, OA, TP	9370, 3600, 8250, 8350, 6310	4.2-11.5	40	8-64	2.4-4.0	NP	128	CISC, 68020	Unix System V	128	60-80	32	$68,000-$75,000	OEM, VAR
	Arix 800, 825	Jan. 1987	1,329	DP, OA, TP	9370, 3600, 8250, 8350, 6310	4.2-8.4	40	8-64	2.4-4.0	NP	NP	CISC, 68020	Unix System V	80	24-50	32	$29,000-$33,000	OEM, VAR
AT&T **(800) 247-1212**	3B2/1000 Model 60, 70, 80	May, June (Model 80) 1989	NP	DP, OA, TP	IBM RT, Microvax II, 3500	5-10.8, 8.5-16 (Model 80)	NP	16-64	5	900M-15.9G	88	WE 32200	Unix System V	88, 100 (Model 80)	50	32	$39,900 (4M-byte memory), $59,900 and $74,900 (16M-byte memory, 2 hard disks) with 300M-byte hard disk, 720K-byte floppy, 120M-byte cartridge tape, power supply	End user, OEM, VAR
	3B2/500	Oct. 1987	NP	DP, OA, TP	IBM RT, Microvax II, 3500	4-6	NP	4-32	5	300M-15.9G	50	WE 32100	Unix System V	50	32	32	$19,900 with 4M-byte memory, 300M-byte hard disk, 720K-byte floppy, 120M-byte cartridge tape, power supply	End user, OEM, VAR
	6386E WGS Models 375, 376	NP	NP	DP, OA	NP	4	100	2-64	NP	435-600	33	80386	MS-DOS, OS/2, Unix System V/386	32	8-24	32	$7,795 with 2M-byte memory, 135M-byte hard disk, 1.44M-byte floppy	End user, dealer, VAR
	6386E/33 Model S	NP	NP	DP, OA	PS/2, Microvax 3300, 3500, Dec-system 3100	7.7	100	4-40	NP	Up to 6.6G	114	80386	Unix System V/386	48	32	32	$17,400 with 4M-byte memory, 300M-byte hard disk, 120M-byte cartridge tape	End user, dealer, VAR
	6386/33 Model 324, 325	NP	NP	DP, OA	NP	7.7	100	4-40	NP	600M-6.6G	114	80386	MS-DOS, OS/2, Unix System V/386	40	16-36	32	$12,095 with 135M-byte hard disk, 1.44M-byte floppy	End user, dealer, VAR
	6386/25 Models 311, 313, 314	NP	NP	DP, OA, SE	NP	6.9	100	4-40	NP	380M-2.4G	66	80386	MS-DOS, OS/2, Unix System V/386	32	8-30	32	$8,495 with 80M-byte hard disk, 1.44M-byte floppy	End user, dealer, VAR
	6386 WGS Models 373, 374	NP	NP	DP, OA	NP	4	100	1-48	NP	380-435	25	80386	MS-DOS, OS/2, Unix System V/386	24	4-16	32	$5,595 with 1M-byte memory, 80M-byte hard disk, 1.44M-byte floppy	End user, dealer, VAR
Bull H. N. Information Systems, Inc. **(617) 895-6000**	DPS 6 Plus Model 201	Dec. 1988	NP	DP, OA, TP	None	0.7	NP	2-16	1.2-1.8	68-300	5	Proprietary	HVS6	NP	4	32	$14,000 with 2M-byte memory, 5 ports, 68M-byte disk, 60M-byte cartridge, diskette	End user, OEM, VAR

*One DEC MIPS equals the performance of the DEC VAX-11/780.
[1] DP=Commercial data processing; SE=scientific/engineering; TP=on-line transaction processing; OA=office automation.
[2] Millions of instructions per second.

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld.* When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Further product information is available from the vendors.

VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET[1]	MOST COMPARABLE IBM OR DEC SYSTEM	PERFORMANCE (MIPS[2])	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabyte/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Bull H. N. Information Systems, Inc. (617) 895-6000	DPS 6 Plus Model P210	April 1989	NP	DP, OA, TP	None	0.7-1	NP	4-16	1.2-1.8	68-600	5-12	Proprietary	HVS6	12	6-10	32	$16,200 with 4M-byte memory, 6 ports, 68M-byte disk	End user, OEM, VAR
	DPS 6 Plus Model P220	April 1989	NP	DP, OA, TP	None	1	NP	8-16	1.2-1.8	68-1,200	5-24	Proprietary	HVS6	40	15-20	32	$26,200 with 8M-byte memory, 6 ports, 68M-byte disk, diskette	End user, OEM, VAR
	XPS-100 Model X-15	June 1988	NP	DP, OA	NP	2.1-2.7	16.67	2-16	5-10	157-807	48	68020	Unix System V.3	48	36	32	$11,245 with 2M-byte memory, 72M-byte fixed disk, cartridge, tape port, power supply	End user, OEM, VAR
	XPS-100 Model X-22, 25	June, Nov. (Model 25) 1988	NP	DP, OA	NP	2.1-2.7, 4.1	16.67, 25	4-16	5-10	157-807, 325-975	48	68020	Unix System V.3	48	36	32	$20,495 (157M-byte fixed disk), $32,670 (325M-byte fixed disk) with 4M-byte memory, 60M-byte cartridge tape, two power supplies	End user, OEM, VAR
	XPS-100 Model X-42, 45	June, Dec. (Model 45) 1988	NP	DP, OA	NP	5.2, 8	16.67, 25	8-32	5-10	157-1,782, 325-1,950	96, 144	68020	Unix System V.3	96, 144	72, 108	32	$41,495 (two 16M-byte cache memories, 157M-byte fixed disk), $54,170 (325M-byte fixed disk) with two 4M-byte memories, 60M-byte cartridge tape, four power supplies	End user, OEM, VAR
Concurrent Computer Corp. (201) 758-7500	5000 and 6000 series	1982	6,000	SE, TP	NP	3-35	30	8-120	3	1049	4-68	CISC	Unix System V, BSD 4.2	64	1-3	32	$31,700 with 8M-byte memory, 142M-byte disk, 150M-byte cartridge tape	End user, OEM, VAR
	3212	1986	3,000	DP, SE, TP	VAX 8250	0.98	260	4-16	3	NP	8	CISC	OS/32, Xelos	64	32	32	$43,000 with 4M-byte memory	End user, OEM, VAR
	3205	1984	500	DP, SE, TP	Microvax II	0.397	400	2-8	1.2	NP	1	CISC	OS/32, Xelos	24	16	32	$21,500 with 2M-byte memory	End user, OEM, VAR
Control Data Corp. (612) 853-8182	Cyber 932-11	March 1987	286	DP, SE, TP	VAX 6000	2.18	50	8-128	1.8-3	NP	NP	CISC	NOS/VE	NP	15	64	$65,090 with 8M-byte memory, CPU, five I/O processors, 6 I/O channels	End user
Data General Corp. (800) 328-2436	Eclipse MV/7800 XP	1987	NP	All	AS/400, Microvax 3400, 3900	1.577	220	2-14	2.67-5	NP	128	NP	AOS/VS, AOS/RT32, DG/UX	90	20-65	32	$23,000 with 2M-byte memory, power supply, I/O channels	End user, OEM, VAR
	Eclipse MV/15000 Model 8	1986	NP	All	Microvax 3900	3.057	85	16-64	2.67-5	NP	512	CISC	AOS/VS, AOS/RT32, DG/UX	512	60	32	$86,200 with 16M-byte memory, 322M-byte disk	End user, OEM, VAR
	Eclipse MV/1000DC series	April 1989	NP	OA	AS/400, Microvax 2000, 3100	1	160	4-12	1.5	40-322	11-27	CISC	AOS/VS, AOS/VS II, DG/UX, DG/RDOS	16	8	32	$12,000 with 4M-byte memory, 179M-byte disk, 21M-byte cartridge tape	End user, VAR
	Eclipse MV/2500DC series	July 1988	NP	OA	AS/400, 9370, Microvax II, 3100, 3300, 3500	1.7	50	8-24	1.5	322-1,324	3-67	CISC	AOS/VS, AOS/VS II, AOS/RT32, DG/UX, DG/RDOS	64	24	32	$30,000 with 8M-byte memory, 322M-byte disk, 21M-byte cartridge tape	End user, VAR
	DG/500	May 1988	NP	OA	PC LAN, 80286	0.3	380	0.5-2	500K	20-160	11-19	CISC	DG/RDOS	16	4	16	$4,995 with 512K-byte memory, 20M-byte disk, 368K-byte floppy disk	End user, VAR
Digital Equipment Corp. (800) 343-4040	Decsystem 3100	May 1989	NP	SE	NA	14.3 integer	80	8-24	1.25-4	2G	0	RISC	Ultrix	64	16	32	$26,929 with 8M-byte memory, diskless, 4-user license, 332M-byte disk, 95M-byte tape	End user, OEM, dealer, VAR
	Decsystem 5400	July 1989	NA	SE	NA	16.6 integer	50	16-64	4	2.4G-9.7G	128	RISC	Ultrix	NP	NP	32	$49,900-$74,400 with 16M-byte memory, 296M-byte tape drive, 128 ports	End user, OEM, dealer, VAR
	Microvax 3100	July 1989	NP	All	AS/400	2.4 VUPS*	100	4-32	4	1.5G	13	CISC	Ultrix-32, VAXELN, VMS	44	24	32	$8,580 with 4M-byte memory, 104M-byte hard disk, 1.4M-byte diskette	End user
	Microvax 3300, 3400	Oct. 1988	NP	All	AS/400	2.4 VUPS*	100	4-52	4	7.2G	128	VAX	Ultrix-32, VAXELN, VMS	44	24	32	$25,000 with 4M-byte memory, 150M-byte disk, 300M-byte tape	End user
	Microvax 3800/3900	April 1989	NP	All	AS/400	3.8 VUPS*	60	16-64	4	9.7G	NP	CISC	Ultrix, VMS, VAXELN	152	76	32	$73,400 with 16M-byte memory, 400M-byte integrated storage element	End user, OEM
	MicroPDP-11/83	NP	NP	SE, TP	PDP-11/70	0.7 VUPS*	220	2-4	2.4	622	1-80	CISC	DSM-11, RSTS/E, RSX-11M, RT-11, Ultrix-11	NP	32	16	$25,990 with 2M-byte memory, 42M-byte hard disk, 1.2M-byte floppy , disk contoller enclosure	End user, OEM
	MicroPDP-11/84	1985	NP	SE	PDP-11/70	NP	220	2-4	2.4	622	1-80	CISC	DSM-11, RSTS/E, RSX-11M, RT-11, Ultrix-11	NP	32	16	$16,000 with 4M-byte memory	End user, OEM
	MicroPDP-11/53	NP	NP	SE, TP	PDP-11/60	0.29 VUPS*	267	0.512-4	2.4	622	1-80	CISC	DSM-11, RSTS/E, RSX-11M, RT-11, Ultrix-11	NP	16	16	$8,270 with 512K-byte memory, 1.2M-byte floppy	End user, OEM
	MicroPDP-11/73	NP	NP	DP, SE, TP	PDP-11/70	0.41 VUPS*	267	1-4	2.4	622	1-80	CISC	DSM-11, RSTS/E, RSX-11M, RT-11, Ultrix-11	NP	32	16	$18,680 with 1M-byte memory, 71M-byte disk, 1.2M-byte floppy	End user, OEM

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VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET[1]	MOST COMPARABLE IBM OR DEC SYSTEM	PERFORMANCE (MIPS[2])	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabyte/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Encore Computer Corp. **(305) 587-2900**	Concept 32/2020	Dec. 1989	0	SE	NA	3-24	150	4-256	2.4	NP	NP	Proprietary	MPX-32	NP	NP	32	$92,000 with CPU, 4M-byte memory, 8 slots, power supply	End user, OEM
	Selconnection	First quarter 1987	800	SE	VAX	3.3-26.1	150	2-144	3	NP	256-2048	CISC	MPX-32	2048	128	32	$35,000 with 4M-byte memory, 8 ports, 2 busses	End user, OEM
	Concept 32/67 Series	Second quarter 1983	700	SE	NP	3.262	150	2-16	3	NP	256	CISC	MPX-32	256	48-64	32	$70,000 with 4M-byte memory, 22 slots	End user, OEM
	Multimax 310	NP	100+	DP, SE, TP	NP	4-20	80	16-80	1.5-18	NP	500	NS 32332	Unix System V.4.2	500	100-200	64	$89,000 with 16M-byte memory, 600M-byte disk, modem	End user, OEM
Harris Computer Systems Div. **(800) 442-7747**	Night Hawk Model 1200, 1200 rack mount	May 1989	NP	SE	NP	7-14	40	40	3	28G	32, 96	CISC	CX/UX, CX/SX, CX/RT	256	32	32	$35,000 with 4M-byte RAM, 1 CPU, 2 ports	End user, OEM, VAR
	H-60	June 1984	NP	SE	NP	0.88	300	1.5-12	2.4	NP	48	Proprietary	VOS, RT-VOS, VUE	48	NP	32, 48	$48,000	End user, OEM, VAR
	H-700	April 1983	NP	SE	NP	0.88	300	7.68-12	2.4	NP	128	Proprietary	VOS, RT-VOS, VUE	128	NP	32, 48	$56,000	End user, OEM, VAR
Hewlett-Packard Co. **(800) 752-0900**	HP 3000 Series 925	April 1988	NP	DP, TP	AS/400, VAX 6210	3	80	32-96	NP	NP	152	RISC	MPE-XL	152	NP	32	$80,000 with 32M-byte memory	End user, VAR
	HP 3000 Series 925LX	April 1988	NP	DP, TP	AS/400, VAX 6210	NP	80	24-96	NP	NP	40	RISC	MPE-XL	40	NP	32	$50,000 with 24M-byte memory	End user, VAR
	Micro 3000GX	April 1988	NP	TP	AS/400, Microvax II, 3100	NP	113	2-4	1.25	152M-2G	8-16	CISC	MPE-V	16	13-14	16	$15,950 with 2M-byte memory, 152M-byte disk, 67M-byte cartridge tape, 8 ports	End user, OEM, VAR

THEIR "RULES."

```
/ * MSG IKJ574I / * Reduce broadcast dataset full messages * /
                 / * to 1 every 5 minutes * /
/ * INIT SECTION * /
prevtime = TIME(m) - 5
/ * PROC SECTION * /
IF (TIME(M) - prevtime > 5) I (TIME(M) - prevtime < 0) THEN DO
        prevtime = TIME(M)
        msg. user = 'DISPLAY'    / * Done for another Rule * /
        RETURN DISPLAY
END
/ * Here when an IKJ574I displayed in the last 5 minutes * /
msg. user = ''
RETURN SUPPRESS
```

OUR RULES.

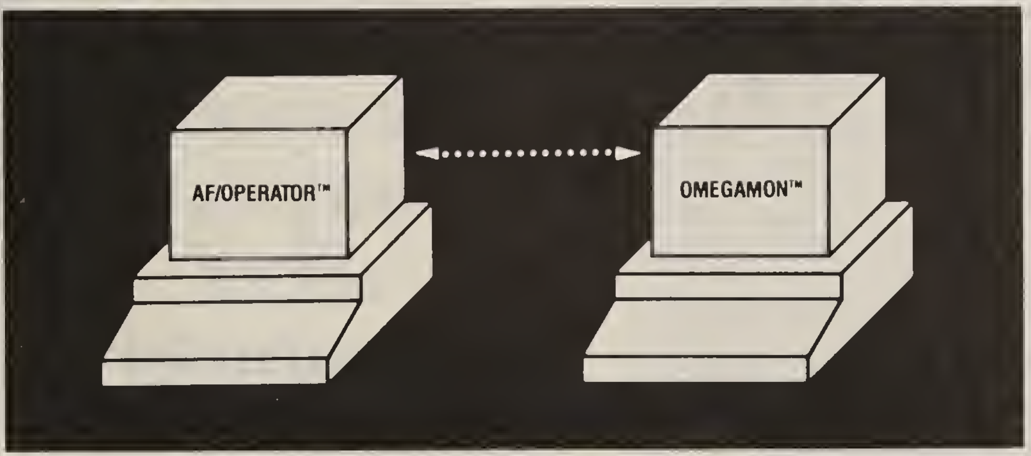
```
MSGID(IKJ574I), SUPRESS
MSGID(IKJ574I), EVERY (5 MINUTES), DISPLAY
```

HARDWARE ROUNDUP

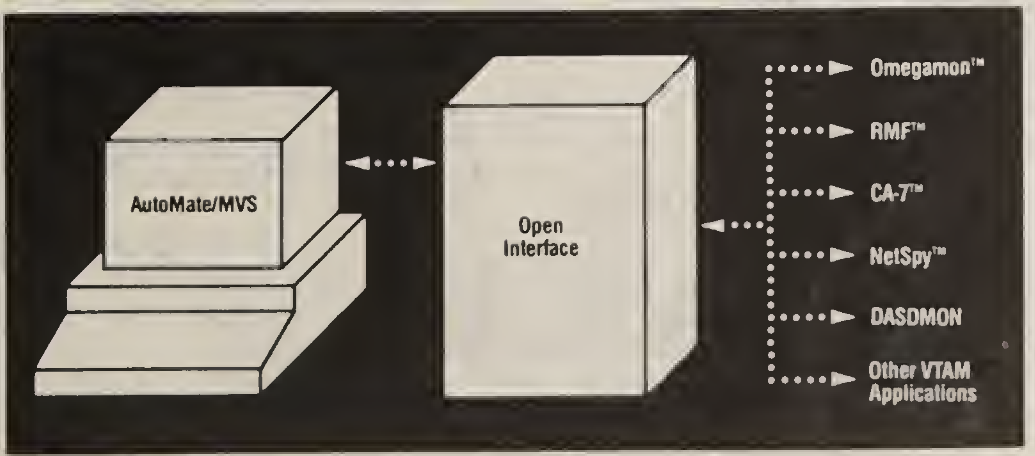
VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET[1]	MOST COMPARABLE IBM OR DEC SYSTEM	PERFORMANCE (MIPS[2])	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabyte/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Hewlett-Packard Co. **(800) 752-0900**	Micro 3000LX	April 1988	NP	TP	IBM S/36, AS/400, Microvax 2000, 3100	NP	113	2 to 4	1.25	81-304	5-8	CISC	MPE-V	8	5-7	16	$10,950 with 2M-byte memory, 81M-byte disk, 67M-byte cartridge tape	End user, OEM, VAR
	Micro 3000XE	Nov. 1986	NP	TP	AS/400, Microvax 3100	NP	117	2-8	NP	4.5G	8-56	CISC	MPE-V	56	17-23	16	$24,000 with 2M-byte memory	End user, OEM, VAR
	HP 9000 Model 825	June 1987	NP	DP, SE	Microvax 3400	3-7	80	8-112	NP	9.1G	72	RISC	HP-UX	72	20-40	32	$25,500 with 8M-byte memory	End user, OEM, VAR
	HP 9000 Model 815S	Sept. 1989	NP	DP, SE	IBM RT, DEC 3300	5.6	NP	8-56	NP	6.8G	50	RISC	HP-UX	50	16-24	32	$14,900 with 8M-byte memory	End user, OEM, VAR
IBM **(800) 365-4426**	AS/400 Model 10	Aug. 1988	NP	DP, OA, TP	NA	NP	120	4-16	1.25	630-945	8-36	VLSI logic	SSP	NP	NP	32	$24,145 with 4M-byte main storage, 630M-byte disk, cartridge tape	End user, VAR
	AS/400 Model 20	Aug. 1988	NP	DP, OA, TP	NA	NA	120	4-28	1.2	630-2205	16-72	VLSI logic	SSP	NP	NP	32	$43,570 with 4M-byte main storage, 630M-byte disk, cartridge tape	End user, VAR
	AS/400 Model 35	Aug. 1988	NP	DP, OA, TP	NA	NP	94	8-40	5.7	400M-9.6G	24-72	VLSI logic	SSP	NP	NP	32	$84,125 with 8M-byte main storage, 800M-byte disk, 160K-byte tape drive	End user, VAR
	System/36 Model 5363	Nov. 1987	NP	DP, OA, TP	NA	NP	100	1-2	1.25	65-420	4	LSI	SSP	NP	NP	8	$12,100 with 1M-byte main memory, 65M-byte disk, 1.2M-byte diskette	End user, dealer, VAR
	9373-25	NP	NP	NP	NA	NP	100	4-16	NP	NP	NP	CISC	VM/IS, VM/SP, VSE/SP, AIX/370, DPPX/370, MUMPS/ VM	NP	NP	32	$26,200 with CPU, minimum memory	End user, dealer, VAR
	9373-30	NP	NP	NP	NA	NA	80	4-16	NP	NP	NP	CISC	VM/IS, VM/SP, VSE/SP, AIX/370, DPPX/370, MUMPS/ VM, MVS/370	NP	NP	32	$38,800 with CPU, minimum memory	End user, dealer, VAR
	9375-50(E)	NP	NP	NP	NA	NP	62.5	8-18	NP	NP	NP	CISC	VM/IS, VM/SP, VSE/SP, AIX/370, DPPX/370, MUMPS/ VM, MVS/370	NP	NP	32	$60,900 with CPU, minimum memory	End user, dealer, VAR
	9375-60	Third quarter 1987	NP	NP	NA	NP	90	8-16	NP	NP	NP	CISC	VM/IS, VM/SP, VSE/SP, AIX/370, DPPX/370, MUMPS/ VM, MVS/370	NP	NP	32	$75,600 with CPU, minimum memory	End user, dealer, VAR
ICL North America, Business Systems **(714) 458-7282**	PowerServer 386 Series	May 1988	100	DP, OA	PS/2	4	NP	4-28	NP	90-700	8-64	CISC	Unix System V	NP	8-24	32	$4,500-$30,700 with 4M-byte RAM, 90M-byte disk, 150M-byte tape, eight ports	End user, dealer, VAR
	Power 6/32 series	1984	1,000	OA	NP	3-15	100	4-128	NP	NP	32-384	NP	Unix	200	100	32	$50,000	End user, OEM, dealer, VAR
MAI Basic Four, Inc. **(714) 730-5100**	Advanced Series 20, 40, 60	May 1988	NP	DP	AS/400, DEC 6300, 6400	NP	80	4-48	2.4	NP	Up to 255	CISC	BOSS/VS	255	180	32	$35,000 with CPU, 4M-byte memory, 364M-byte disk, 6 ports	End user, dealer, VAR
	MAI 1500	1986	NP	DP, OA	NP	NP	NP	640K	NP	31-230	9	80286	MS-DOS	9	5	NP	$3,000 with 640K-byte memory, 31M-byte disk, 2 ports	Dealer, VAR
	MAI 1800	1987	NP	DP	NP	NP	NP	1.6-2.6	NP	40-230	17	80286	MS-DOS, BOSS/IX	17	10	NP	$4,500 with 1.6M-byte RAM, 40M-byte disk, 2 ports	Dealer, VAR
	MAI 2500	1988	NP	DP	NP	NP	NP	2-4	NP	71-245	14	68020	BOSS/IX	14	6-8	NP	$10,000 with 2M-byte RAM, 71M-byte disk, 7 ports	End user, dealer, VAR
	MAI 3000	1985	NP	DP	AS/400	NP	NP	4-10	NP	NP	10-34	68020	BOSS/IX	34	16	NP	$14,000 with 4M-byte RAM, 71M-byte disk drive, 11 ports	End user, dealer, VAR
	MAI 4000	1987	NP	DP	AS/400 B20	NP	NP	8-16	NP	NP	34-74	68020	BOSS/IX	74	40	NP	$45,000 with 8M-byte RAM, 347M-byte disk drive, 37 ports	End user, dealer, VAR
McDonnell Douglas Information Systems Co. **(714) 566-4000**	Series 18	1987	375	DP, TP	AS/400	NP	NP	4-32	20	NP	32-400	Proprietary CISC	Reality	400	100	32	$85,000 with 4M-byte memory, 300M-byte disk	End user, OEM, dealer, VAR
	Series 6000	1984	5,000	DP, TP	AS/400	NP	NP	1-4	10	75M-1.4G	8-120	Proprietary CISC	Reality	NP	20-40	NP	$22,500 with 1M-byte memory, 8 ports, 75M-byte disk	End user, OEM, dealer, VAR

VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET[1]	MOST COMPARABLE IBM OR DEC SYSTEM	PERFORMANCE (MIPS[2])	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabyte/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Mips Computer Systems, Inc. **(408) 720-1700**	M/120	Second quarter 1988	1,000	DP, SE	DEC 5400	13	60	8-48	1	663	Up to 36	RISC	Unix	NP	NP	32	$30,000-$35,000 with 8M-byte memory, 4G-byte disk, cartridge tape, four AT slots	OEM, VAR
Motorola Computer Group **(408) 255-0900**	Delta Series 3000 Model 3,200	May 1989	NP	OA	AS/400	4.7	NP	4-16	125	NP	16	CISC	Unix System V	16	4	32	$7,495 with 4M-byte memory, 48M-byte disk, 155M-byte tape drive	End user, OEM, dealer, VAR
	Delta Series 3000 Model 3300, 3600	June 1988	NP	OA	AS/400	3.8, 4.7	NP	4-16	12	NP	36, 48	CISC	Unix System V	36, 48	20, 36	32	$11,995 (85M-byte disk), $19,725 (150M-byte disk) with 4M-byte memory, 150M-byte tape drive	End user, OEM, dealer, VAR
	Delta Series 3000 Model 3640	Sept. 1988	NP	OA	AS/400	5.3	NP	8-32	12	NP	64	CISC	Unix System V	64	42	32	$27,425 with 8M-byte memory, 150M-byte disk, 150M-byte tape drive	End user, OEM, dealer, VAR
	Delta Series 3000 Model 3840	Oct. 1988	NP	OA	AS/400	5.9	NP	8-40	12	NP	96	CISC	Unix System V	96	64	32	$36,425 with 8M-byte memory, 300M-byte disk, 150M-byte tape drive	End user, OEM, dealer, VAR
NCR Corp. **(513) 445-5000**	NCR Tower 32/200	April 1988	NP	DP, OA	IBM RT	NP	60	1-8	NP	51-270	4-11	CISC	Unix System V.3	11	7	32	$6,985 with 2M-byte RAM, 51M-byte disk, 1M-byte flex, 4 ports	End user, OEM, VAR
	9800 series	June 1986	NP	DP, TP	AS/400, 9370	1	145	8-32	1.5	816M-178G	10-19	CISC	VRX/E	NP	100-800	32	$60,840 with 8M-byte memory, 10 channels	End user

THEIR INTERFACE.



OUR INTERFACE.



VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET[1]	MOST COMPARABLE IBM OR DEC SYSTEM	PERFORMANCE (MIPS[2])	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabyte/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
NCR Corp. (513) 445-5000	Union	Feb. 1989	NP	DP, TP	NP	NP	230	1-16	5	NP	48	RISC	Unix	32	16	32	$34,625 with 4M-byte memory, 140M-byte disk, 4M-byte tape	End user
NEC Information Systems, Inc. (508) 264-8000	Businessmate 386/20	April 1988	900	OA, TP	PS2	4-7	90	2-16	0.98	600	4-16	80386	SCO Xenix 386, MS-DOS	16	6-8	32	$6,999 with 2M-byte RAM, 140M-byte disk, 4 ports, power supply	Dealers, VAR
	Astra XL/100	March 1989	NP	DP, OA	Microvax	4	NP	2-10	1.25	580	16	Multibus	NEC ASTR-IX	16	8-16	32	$8,995 with 2M-byte memory, 8K-byte cache 1.2M-byte floppy	VAR
	Astra XL/200, 300	March 1989	NP	DP, OA	IBM RT, Microvax	5	40	2-34, 2-66	1.25	NP	64	Multibus	NEC ASTR-IX	64	32, 64	32	$13,995, $18,995 with 2M-byte memory, 16K-byte cache, 62M-byte floppy	VAR
Nixdorf Computer Corp. (617) 890-3600	Targon 31 Series	NP	NP	DP, OA	NP	5.5-16.5	NP	8-40	NP	700M-2.8G	NP	68030	TOS	64	32	32	$15,000-$50,000	End user
	Targon 386	Feb. 1989	NP	DP, OA	NP	3	NP	2-10	NP	40-360	4	80386	MS-DOS, Xenix	10	5	32	$6,000-$10,000	End user
	8850	NP	NP	DP	NP	NP	NP	NP	NP	NP	NP	Proprietary	DIDOS	NP	NP	16	$20,000-$100,000	End user
Prime Computer, Inc. (508) 655-8000	2455	July 1987	NP	All	AS/400, Microvax 3100	1.6	120	4-12	2.4	NP	40-256	CISC	Primos	600	20-30	32	$19,900 with 4M-byte memory, 84M-byte disk, 60M-byte cartridge tape, CPU	End user, VAR
	2850	June 1989	NP	All	AS/400, Microvax 3100, DEC 3300	2.6	82	8-32	1.5	NP	64-256	CISC	Primos	960	30-40	32	$44,660 with 8M-byte memory, 328M-byte disk, CPU	End user, VAR

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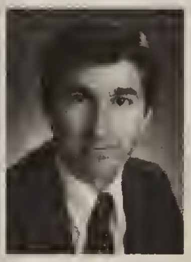

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VENDOR	PRODUCT	DATE FIRST INSTALLED AT CUSTOMER SITE	NUMBER CURRENTLY INSTALLED	PRIMARY MARKET[1]	MOST COMPARABLE IBM OR DEC SYSTEM	PERFORMANCE (MIPS[2])	MACHINE CYCLE TIME (nsec)	MEMORY RANGE (megabytes)	DISK TRANSFER RATE (megabyte/sec.)	DISK CAPACITY (megabytes)	NUMBER OF PORTS	PROCESSOR TYPE	OPERATING SYSTEMS	MAXIMUM NUMBER OF USERS	TYPICAL NUMBER OF USERS	WORD LENGTH (bits)	PRICE	DISTRIBUTION
Prime Computer, Inc. **(617) 655-8000**	2950	Aug. 1989	NP	All	AS/400, DEC 3800, 3900, 6310	3.9	77	8-32	1.5	NP	64-256	CISC	Primos	960	50-60	32	$88,510 with 16M-byte memory, two 328M-byte disks, CPU	End user, VAR
	4050	Feb. 1988	NP	All	AS/400, DEC 3400	2.8	82	16-32	2.4	NP	128-512	CISC	Primos	960	50	32	$88,000 with 16M-byte memory, 496M-byte disk, CPU	End user, VAR
	Prime EXL MBX	May 1989	NP	DP, OA	PS/2	3.2	NP	2-16	NP	Up to 417	34	80386	Primos	10	10	16	$8,200 with 2M-byte memory, 94M-byte disk	End user, VAR
Sequent Computer Systems, Inc. **(503) 626-5700**	Symmetry S27	Sept. 1987	423	NP	DEC 6360	8-40	625	8-80	1.5	NP	186	CISC	DYNIX	300	30-150	32	$94,500 with 2 CPUs, 8M-byte memory, 150M-byte disk	End user, OEM, VAR
Stratus Computer, Inc. **(508) 460-2000**	Stratus XA2000 Models 50, 70	Oct. 1987	NP	TP	IBM System 88	NP	62.5	8-16	Up to 2.45	NP	52-112	CISC	VOS	NP	NP	32	$79,000	End user, OEM, VAR
Tandem Computers, Inc. **(408) 725-6000**	Nonstop CLX	Fourth quarter 1987	NP	TP	IBM 9370, DEC 8530	1-6	133	6-12	1.2	10,800	3-612	CISC	Guardian 90	3-612	50-300	32	$53,000 with CLX processor, 6M-byte memory, two 145M-byte disk drives, cartridge tape drive, power supply	End user
	Tandem LXN	Jan. 1987	NP	TP	VAX 1100/780, 8100, System/36	NP	NP	2-16	10	NP	NP	68020	Unix System V	32	18-24	32	$23,700 with 2M-byte memory, 60M-byte cartridge tape, 80M-byte hard disk	End user
Texas Instruments, Inc. **(800) 527-3500**	1000 Series System SP1000 Model 1006E	April 1988	NP	DP	IBM PS/2	NP	NP	2-12	0.98	NP	3	80386	TI System V	16	8	32	$3,495 with 2M-byte memory, 1M-byte floppy	VAR

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Texas Instruments, Inc. **(800) 527-3500**	1000 Series System 1200 Model 1205NT	April 1988	NP	DP	IBM PS/2	NP	NP	2-16	0.98	NP	8	80386	TI System V	24	8-24	32	$8,005 with 2M-byte RAM, 8M-byte cache memory, 48M-byte disk, 1.2M-byte floppy	VAR
	1000 Series System 1300 Model 1325	Nov. 1987	NP	DP	IBM PS/2	4	50	4-16	10	NP	8	80386	TI System V	32	16-32	32	$22,655 with 4M-byte memory, 182M-byte disk, 60M-byte tape	VAR
	1000 Series System 1500 Model 1520	Oct. 1986	NP	DP	DEC VAX 8200, 8300	2.5-10	480	2-40	1.81	NP	8	68030	TI System V	Up to 256	NP	32	$84,000 with 16M-byte memory, 380M-byte disk, 60M-byte tape	VAR
Third Coast Technologies, Inc. **(414) 272-4220**	EL386	1988	NP	DP, OA, TP	PS/2	4.6	62	1-16	7.5	250	2	CISC	MS-DOS, SCO Xenix, THEOS	16	8	32	$4,250 with 1M-byte RAM, 30M-byte disk	OEM, dealer, VAR
	Talos 386	1986	NP	DP, OA, TP	PS/2	6	40	4-16	32	1.4G	16	CISC	MS-DOS, SCO Xenix, THEOS	64	16	32	$11,208 with 4M-byte RAM, 110M-byte disk, 16 ports	OEM, dealer, VAR
Unisys Corp. **(313) 972-70000**	NGEN CP-0A3	1987	61,295	OA	NP	3.2	62.5	1-4	1.5	2.2G	16	80386	CTOS	16	16	16	$4,800 per user	End user, OEM, VAR
	NGEN PHD-140	1988	61,295	OA	NP	5	40	4-24	1.5	140M-2.2G	32	80386	CTOS	32	32	16	$11,500 per user	End user, OEM, VAR
	NGEN CP-0A2, CP-0E2, CM-004	1985 (0A2), 1989	61,295	OA	NP	1.1	125	1-4 (0A2), 2-8	1.5	2.2G	12	80286	CTOS	12	12	16	$2,800, $3,000, $2,000	End user, OEM, VAR
	U5000/55	June 1988	NP	DP, OA, TP	Micro-vax II, 3000, System/36, AS/400	NP	25	4-16	2.5	170M-4.8G	64	NP	Unisys System V	64	14-32	32	$33,900 with CPU, 4M-byte memory, 170M-byte disk, 150M-byte tape	NP
	U5000/85 UP, DP	Jan. 1988	NP	DP, OA, TP	Micro-vax II, 3000, System/36, AS/400	NP	25	4-64	2.5	170M-1.9G, 337M-8.1G	80	NP	Unisys System V	80	16-64	32	$39,900, $54,900 with CPU, 4M-byte memory, 170M-byte disk, 150M-byte tape	NP
	U5000/95 UP, DP	Jan. 1988	NP	DP, OA, TP	Micro-vax II, 3000, System/36, AS/400	NP	25	8-64	2.5	337M-8.1G, 20M-2.3G	128	NP	Unisys System V	128	32-64	32	$68,000 (1 CPU), $83,000 (2 CPUs) with 8M-byte memory, 337M-byte disk, 150M- byte tape	NP
	B38	March 1987	NP	DP, OA, TP	AS/400, System/36, Micro-vax II, 3000	NP	16	1-4	0.6	20M-2.3G	NP	NP	BTOS, MS-DOS	64	12-64	16, 32	$5,035 with 1M-byte memory, power supply, four ports	
	Micro A (MA 800)	Jan. 1989	NP	DP, TP	AS/400	NP	NP	12-12	1.2	1.4G	NP	CISC	MCP/AS, OS/2	NP	16	64	$19,900 with 12M-byte memory, 280M-byte disk, 150M-byte tape	NP
Wang Laboratories, Inc. **(508) 459-5000**	VS 5000 Series	July 1988	5,500	DP, OA	AS/400	NP	180	1-16	1.25	10G	Up to 128	CISC	VSOS, VS/VM, IN/IX	128	4-128	32	$8,800 with 1M-byte memory, CPU, 72M-byte disk, 1.2M-byte floppy, four ports, power supply	End user, VAR
	VS 7000 Series	Jan. 1987	4,000	DP, OA, TP	AS/400	NP	120	4-32	3	NP	Up to 928	CISC	VSOS, IN/IX	Up to 1,012	16-300	32	$75,000 with 4M-byte memory, one serial I/O controller	End user, VAR
Wicat Systems **(800) 224-6400**	System 2255	Jan. 1988	250	TP	NP	4	NP	4-12	16	1.8G	Up to 32	68020	Proprietary	32	24	32	$29,000 with 4M-byte memory, four ports, power supply	End user

Document imaging: The right fit?

Identifying high-payoff applications is key

BY WICK KEATING

DEBORAH WITHEY

While document imaging is fast entering the mainstream, many information systems managers are not sure where this information processing technology fits into their organization. Experience has shown that it is more effective for some applications than others, so the key to successfully implementing document imaging is to identify uses with potentially high payoffs.

Document imaging replaces paper documents and files with digitized images of the original. Paper documents are converted to electronic form via scanners. The resulting pattern, known as a bit map, is an exact representation of the paper image.

Digitized images are stored on optical discs or other media and often are transmitted via data communications networks. Users control the scanning, storing, retrieving, reviewing and routing of document images through desktop workstations equipped with large, high-resolution displays and software for manipulating and displaying images.

Many current document imaging systems are stand-alone and relatively small — in the tens of users. A few have limited integration with other information processing systems. Many installed systems serve as electronic replacements for file cabinets — documents are scanned, stored and retrieved on demand.

The first large-scale systems — hundreds of users and more — are now coming into use, thanks to new technology that has made them economically feasible to build. Vendors are starting to offer products with higher capacity, greater reliability, better performance and facilities for integrating them with data processing systems.

Until recently, many document imaging systems were based on proprietary architectures.

Today, the clear trend is toward larger integrated systems based on standard architectures and components — that is, workstations and networks.

At first glance, it would seem simple to identify likely situations for document imaging: Just look for operations with lots of paper, large numbers of file cabinets, busy mailrooms and desks piled high with paper and folders.

While that is the right way to start, identifying good potential applications is more complicated. You may find, for example, that the paper in all those file cabinets is rarely referenced and that these cabinets (or microfilm) really are the most cost-effective answer. You may also find that paper can be eliminated by using another technology.

Furthermore, because document imaging systems range from single workstations to

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Keating is a vice-president at American Management Systems, Inc., an Arlington, Va., software and systems integration firm. He heads a group specializing in the planning and implementation of document imaging and other advanced information technologies.

- **Paper-choked areas are a good start**
- **Look to improve service, cash flow, cost**
- **Smart organizations rethink processes**

large systems with hundreds of users and millions of documents, the definition of "large" is vague. Even the simplest standalone system costs between $30,000 and $50,000 and large-scale systems can cost several million dollars, so paper volume must be quite high to justify the investment.

Imaging requires powerful PC workstations and expensive software to manage information flow. It also produces huge amounts of data that must be stored. For example, even after applying data compression techniques, a typical 8½- by 11-in. page still occupies 50K bytes or more of storage. Storage costs can be a major factor in driving up system costs.

Even the goal of eliminating large amounts of paper may not be enough to justify an investment in document imaging. Consider a credit card application processing operation. The application consists of a single document from which a few key pieces of data are extracted (income, savings, outstanding debt). In this case, the most effective approach may be simply to keep keying the needed data into a traditional DP system and file the application away.

In contrast, processing mortgage applications — where there are a number of documents coming in over a period of time, where each of the documents receives close scrutiny and where there is a market advantage to speedy approval — may be an ideal use of the technology.

Assuming that enough paper can be eliminated, other signs indicate that an application may be well suited to document imaging:

- Needed information cannot be captured with a few keystrokes.
- Paper flow cannot be replaced with another form of automation.
- Paper must be retrieved frequently during processing.
- Documents must be retrieved by a number of individuals.
- Paper requires significant processing or handling.
- Documents contain information essential to the business or organizational mission.
- User organization is amenable to new technologies and procedures.
- The application is suited to the technology's capabilities.

Unfortunately, it is impossible to give precise or quantitative guidance on applying these factors. For one thing, the cost of document imaging systems is dropping, and the systems are getting more powerful. The result is that any guideline, such as the minimum size needed to justify a system, quickly becomes outdated.

Moreover, purchases may be justified based on one of these factors or a combination. The payoff for one application may be in reducing the high volume of paper storage. For another, it may be in reducing search-and-retrieval activity. The payoff for a third application might come from streamlined processing, and yet another might benefit from better document tracking.

Document imaging is well suited to applications for which paper cannot be eliminated through other, less expensive forms of automation such as electronic mail and electronic data interchange (EDI). In general, imaging is a good choice in several cases: when paper comes in from outside the organization, where there is no option for EDI or other form of direct data capture and when information on paper cannot be "coded." Signatures, handwritten information or diagrams on paper are well suited to imaging.

Likewise, if a paper trail is needed for audit or regulatory reasons, imaging may be appropriate. In some cases, imaging can be a short-term strategy prior to implementing EDI. Hybrid solutions using EDI and imaging may also be effective.

Using such an approach, transactions with large suppliers could be automated using EDI, while smaller scale transactions would remain paper-

Telltale signs

Any of the following can indicate that image processing is a good fit

Large amount of paper produced
- Crowded physical files
- Multiple documents in each file
- Extensive use of microfilm/microfiche

Data cannot be keyed
- Drawings
- Handwritten information
- Signatures

Frequent accesses and retrievals
- Same information is used by different people or organizations
- Frequent customer inquiries
- Heavy reliance on filed information

Extensive processing required
- Multiple views and decisions
- Complex routing

Information is critical
- Errors are costly
- Direct relationship to customer service

User organization amenable
- Willing to do business in new ways
- Enthusiastic about benefits
- Understands effort required to implement a new system

SOURCE: AMERICAN MANAGEMENT SYSTEMS INC. CW CHART: JOHN YORK

Get the paper out

For organizations willing to bear the expense, document imaging systems can yield significant benefits:

- Increased staff productivity.
- Reduced costs for paper handling.
- Faster transaction processing.
- Improved control over organizational work flow.

Handling large numbers of paper documents and files is surprisingly expensive. Costs include the staff needed to file, retrieve, copy and transport paper, as well as the price of storage space and copying equipment.

In contrast, documents scanned into an imaging system can be filed, retrieved, reproduced and distributed with the push of a button. This eliminates labor costs associated with paper handling, as well as the need for large storage facilities.

Since scanned documents can be viewed by multiple users simultaneously, the need for copying is greatly reduced. Further, lost productivity because of critical documents being "out of file" is eliminated.

> WORK-FLOW software can produce tremendous reductions in the time it takes to move information through an organization. It also can significantly increase staff productivity.

American Express Co. has reduced the number of document handlers and clerical staff needed to process credit card slips from 300 to six by introducing document imaging technology.

The United States Automobile Association expects its document imaging system to eliminate thousands of square feet of expensive storage space now used to house claims files.

A major cost of paper-intensive processes is the time spent by managers and professional staff on chores such as locating necessary pieces of paper or files. Document imaging can greatly reduce time needed for such activities.

Although difficult to measure accurately, time spent searching for files or documents prevents knowledge workers from applying their skills and experience to higher value activities, such as reviewing credit applications and claims, making underwriting decisions and responding to customer inquiries.

When transactions are paper-based, processing is limited by the speed the paper can move through the organization. For example, customer correspondence cannot be answered until it has reached the proper individual, mortgages cannot be approved until all supporting documents have been received and reviewed, and insurance claims cannot be paid until all documentation has been reviewed by a claims adjuster.

Document imaging lifts this constraint. Once documents are received, they can be scanned and made available immediately to all interested parties. The result is faster, more responsive service, better cash flow — and a competitive edge.

The U.S. Department of Veterans Affairs, for example, uses a document imaging system to process claims for educational benefits under the GI Bill. In the paper environment, it often took several days to locate the file and respond to the inquiry.

Now, veterans' inquiries about the status of their claims are answered immediately over the phone. The department's imaging system has yielded a major improvement in service to veterans and increased the morale of employees handling inquiries.

One of the problems of paper processing is the lack of control. With scattered documents and files, it is often difficult to determine the backlog of work, the status of a given transaction or the location of a particular document or file. Paper processing also makes it harder to enforce policies and procedures and control errors.

Since electronic document processing can be managed with software, information systems departments can implement sophisticated reporting capabilities. This gives managers and supervisors the tools needed to effectively monitor operations.

Using software to control work assignments and processing flow, managers can ensure that work is assigned to the right person and handled in the proper order. For example, work-flow software can automatically assign claims to adjusters based on the type of claim and the adjuster's work load, assign cases to investigators based on the type of case or assign credit applications to loan officers based on the requested amount.

Such systems also give users all the information needed for processing — images of documents as well as data from other systems — and present it in the appropriate sequence.

Well-designed work-flow software can ensure that work gets handled in the optimum sequence (oldest to newest, highest to lowest) rather than in such less desirable, unofficial ways as thin files first.

A key feature of document imaging is that it can use software to control the flow of information, that is, files, documents and data, through the organization.

This so-called work-flow software makes sure that the right information is presented to the right people at the right time. It also automates many routine, time-consuming tasks that staff members must perform in a paper-based operation and provides a tool to effectively manage processes that consistently rely on paper-based information.

The software can also check to see if a file is complete (that is, all documents have been received); assign work to individuals (assign a claim to an adjuster or a credit application to a loan officer); direct the order of processing by individuals (work on the oldest first, the largest dollar items first); route files from one individual to another or one department to another; retrieve related information, such as data from a customer database; or track and report the status of documents and files.

Work-flow software can produce tremendous reductions in the time it takes to move information through an organization. It also can significantly increase staff productivity.

Designing the most effective work-flow application is not easy, however. Replacing paper with images and automating the current flows and processing is not the way to achieve the maximum return on an investment in document imaging.

Success requires a thorough understanding of the operation being automated; it also depends on the vision to redesign business processes to take advantage of the capabilities of the technology.

WICK KEATING

based and be processed with document imaging.

Many functions that have traditionally used paper as a medium to transmit information can be automated in ways that replace paper altogether. For example, with the proper software, EDI can automate common business transactions such as purchase orders and invoices between business entities.

The downside is there are likely to be suppliers or customers who do not have EDI capability. Or you may need to follow EDI-initiated transactions with paper backup as a protection against disputes over erroneous electronic transactions.

Some firms are eliminating, or at least reducing, paper through E-mail or new systems that capture needed information directly. For example, much of the paper associated with internal administrative matters can be eliminated with E-mail.

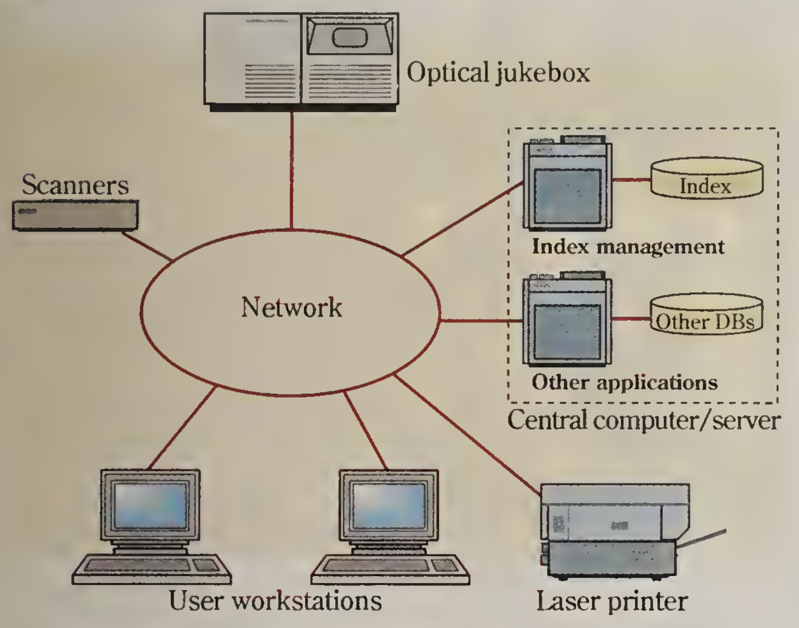
Sterling qualities

Document imaging also shines in situations where documents must be located and retrieved frequently, quickly or at multiple points during processing. It is also a strong choice when documents must be available to many people. Because this approach provides fast, reliable access to any number of users, processing is sped up, and the cost and delay resulting from locating, copying and distribution documents are eliminated.

The more complicated the processing — and the more hands the paper must pass through — the more document processing can be useful. Conversely, a process in which paper comes to a single person who reviews it once and files it is not likely to be appropriate for imaging.

A typical document imaging system

Input from networked devices is displayed on user workstations



SOURCE: AMERICAN MANAGEMENT SYSTEMS, INC.

CW CHART: FRANK C. O'CONNELL

Some good candidates are processes in which a number of documents must be matched up before the transaction can be processed, where multiple individuals must review the file, where there is a preferred order for working on cases or where the files are assigned to individuals based on factors such as the type of case.

Areas likely to yield the highest return on investment from document imaging are likely to be those that are essential to the business. Examples include underwriting or claims in the insurance industry; case processing in government agencies; credit application processing in banking; and order processing, billing and customer service in any industry.

Like any new technology, document imaging should be introduced in a receptive environment. Firms selected for the initial use of document imaging should have a staff and management that are open to doing business in new ways. They should also be willing to accept the inevitable minor problems that arise when new systems are implemented.

The last major determining factor to consider is technological feasibility. Some potential applications are not technologically possible or would be too expensive or risky. For instance, an application that requires giving thousands of widely dispersed users immediate access to a central store of images cannot be built today using an off-the-shelf imaging product.

This situation is quickly changing, however, and money might be wisely spent on designing and installing an initial pilot project to determine details of how the technology would be used and procedures revised. Early users say the best results occur when business processes are redesigned to take advantage of the new technology. Simply automating old ways of doing things is not the best approach.

The decision to implement document imaging systems can be complicated by the fact that many potential users are unfamiliar with the technology. Because they lack experience to draw from, first-time users often find it difficult to visualize how a system will be used or help their business.

Key to a successful effort is to work closely with users to educate, explore and conceptualize ways in which the technology can be applied and probe the critical details of expected usage, such as how often and in what order documents are needed.

The problem is further complicated by limited experience with large-scale production operations. This makes it difficult to predict performance or operational impact. Furthermore, the cost of document imaging systems is high; thus, mistakes can become quite expensive.

Ultimately, determining whether you have a good application for document imaging should be a business decision, based on a thorough consideration of key factors, such as cost, benefits and risk. The challenge is to assess all the impacts of the technology — including costs, benefits, organizational changes and process changes — and select the best combination of technology, people and procedures. Choices should be based on a clear understanding of business impacts. •

After document imaging, office cartoons?

BY WILLIAM STALLINGS

Voice, data, image. All have been incorporated into the office of today. The next frontier is video, whose arrival in the office environment has already begun. More thinking is starting to take place today about how business can exploit recent leaps in video technology.

Some applications are obvious: more videoconferencing, videophones, video versions of videotext and so on. In pondering all of this, the business decision maker would do well to explore the power of animation. Developments in the entertainment industry can be instructive.

In the past decade, graphic novels — which have been called "cartoon books for adults" — have captured attention in the U.S. The rest of the world, inspired by the graphic novel, has been producing serious, adult animated film for many years.

Until recently, animated film and video in the U.S. was used primarily for children's entertainment. Feature-length animated films were few and far between. Disney films were representative of the genre. A notable exception, and a successful one, was *Who Framed Roger Rabbit.* Buoyed by that movie's success, other full-length animated films will follow.

If animation is valid for entertainment, it can be useful in business as well. Educational and training films can be made more quickly and economically using animation than filming live action. Engineering documentation, advertising material and project proposals are among the many other possibilities. The cost of the hardware related to video transmission and storage has dropped dramatically. Building on advances in static image manipulation (i.e., computer graphics), software is arriving. Already, a substantial body of tools is available for automating the animation process.

True interactive animation, which will allow animated sequences to be created in real time and modified and manipulated as effectively as can now be done with static images, is now in the laboratory and on the threshold of commercial availability.

Developments in several key areas portend the increasing use of video in the office environment:

- **Transmission capacity:** It has never been greater and is still growing. Yesterday's 10M bit/sec. Ethernet is today's 100M bit/sec. FDDI local-area network. High-capacity T1 lines are enjoying increasing use. Broadband Integrated Systems Digital Network, with subscriber loop rates in the hundreds of megabits per second, is within sight.
- **Processing power:** Workstations and personal computers are beginning to offer the processing power to handle images — even moving images — with some facility. Hardware, of course, is getting faster all the time. Software is not far behind. OS/2, for example, was designed to allow device manipulation to bypass the traditional cumbersome operating-system mediation that can place unnecessary limits on the fastest of machines.
- **Storage:** Nonerasable and erasable optical media have achieved densities that put massive storage at the command of small office machines.

These three factors have led to the growing use of static or still image processing in the office. IBM's Image Plus system is one example. But several other ingredients are needed to keep moving images advancing in the office.

Compression technology: This is the key. Algorithms that execute quickly and shrink dramatically have been developed for video information. For example, Intel Corp. has developed an optical disc storage algorithm that allows more than 60 minutes of video to be stored on a disk that, up until now, could only store 60 minutes of audio.

Digital/analog compatibility: Digital broadcast television is some way off. But digital transmission of video information is here and improving. As with storage, digital transmission depends on powerful, rapid compression. Video codes can compress images and transmit them in real time at a wide scale of data rates, with corresponding quality.

The technology for computer-generated animation exists. The hardware and software are now within reach of the small office system, and the possibilities are many. IS managers may find that this intriguing technology is worth a look.

Stallings is president of Comp-Comm Consulting, in Pride's Crossing, Mass.

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COMPUTERWORLD

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NEWSPAPER

SECOND CLASS MAIL

Court: States may tax net traffic

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — A U.S. Supreme Court ruling last week will allow states to tax interstate voice and data traffic.

With several states having already enacted such taxes and others desperately seeking new sources of revenue, the decision could raise the cost of business communications and affect the location of data centers.

The decision upheld an Illinois law imposing a 5% excise tax on interstate voice and data transmissions that begin or end in the state. Approximately a dozen states have similar taxes, and more states are expected to follow suit.

Axed with taxes

Illinois collected $142 million in taxes by mid-1987 and continues to collect revenue at a rate of $10 million per month from business and residential users, according to a court filing.

Business network managers, especially those with high-volume transaction networks such as airline reservation systems, may wind up moving their data centers to "tax haven" states that do not impose telecommunications taxes, according to experts.

"This will definitely affect site-location decisions," said Kenneth L. Phillips, vice-president of telecommunications policy at Citicorp in New York and chairman of the Committee of

Continued on page 16

Revenue enhancers

A dozen states already have some form of tax on interstate telecommunications, and more are expected to follow as a result of last week's green light from the U.S. Supreme Court

NAS deal brings new lineup to plug-compatible market

BY JEAN S. BOZMAN
and CLINTON WILDER
CW STAFF

SANTA CLARA, Calif. — Months of uncertainty for users of National Advanced Systems CPUs came to an end last week with National Semiconductor Corp.'s sale of 50% of its mainframe unit to Memorex Telex N.V.

After dozens of rumors about the potential sale, the deal — a total package estimated at between $300 million and $350 million — appears to guarantee continuity for customers, at least in the near term. NAS management will stay in place, and no work force reductions are anticipated, a NAS spokeswoman said. But with Memorex Telex obtaining an option to buy out all of National Semiconductor's stake at an unspecified future date, further changes could occur.

"National obviously is headed in a different direction than they were before, but we're encouraged that they kept half the company," said Richard Lester, vice-president of corporate development at Seattle-based Associated Grocers, Inc., which runs a NAS AS/XL 60 and 90/60. "We've done business with Memorex [for several years], and we're very comfortable with them."

Continued on page 8

On SQL Server's test trail

BY DOUGLAS BARNEY
CW STAFF

A glaring shortage of front-end development tools and the lack of a finished product has not stopped a handful of the U.S.' largest corporations from hatching SQL Server applications.

SQL Server, announced one year ago by Ashton-Tate Corp., Microsoft Corp. and Sybase, Inc., is a multiuser database engine designed for the OS/2 operating system.

It implements the so-called client/server architecture, under which a server handles data management while users' workstations provide the interface or front end.

Users who are anxious to get cracking have been forced to buy the $1,995 Network Development Kit, which is essentially a beta-test version of the software.

Of the 800 units sold, some 200 to 250 have been snapped up by corporations, according to Microsoft SQL Server product manager Dave Kaplan.

System One Airplane Services, a subsidiary of Texas Air Corp., already has a prototype application running under SQL Server, and the results are promising. Curt L. Abraham,

Continued on page 6

Chip prices drop; PC prices don't

BY WILLIAM BRANDEL
CW STAFF

While several vendors used memory costs as an excuse to hike personal computer prices last year, no one is yet promising to bring them down now that the shortage is over.

According to memory-card product vendors and industry analysts, dynamic random-access memory chips are now increasingly available, and prices are dropping. Prices of 1M-bit chips are projected to plummet more than 50% by year's end.

Already, the volume purchase price of 1M-bit chips has dropped to less than $20 per chip. When the memory crisis peaked in June, the price hovered at $50 to $60. Semiconductor price trackers now project that chip prices will fall below $10 this year.

But vendors that raised system prices during the dearth — including Apple Computer, Inc.,

Continued on page 113

When the chips come down

With availability increasing, the price for 1M-bit memory chips has dropped slightly in recent months and is expected to plummet

Nov '88	$3.85	$18.75
Dec '88	$3.85	$18.25
Q1 '89 projected	$3.50	$15.75
Q4 '89 projected	$2.58	$8.64

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COMPUTER INDUSTRY

INDUSTRY INSIGHT

Peter Bartolik

Money where it matters

With Ronald Reagan, we had the image presidency. How appropriate that his successor is rapidly constructing the smoke-and-mirrors presidency.

George Bush is a nice guy, everyone agrees. He's not a Washington-basher, so the beltway crowd thinks everything is just . . . nice.

Well, if he's so *nice*, how come he's not picking up the check?

The administration offered a nice high-tech research policy initiative earlier this month, charting out a five-year plan that would cost $1.9 billion. Unfortunately, there's no commitment that any funding will be made available or even be requested in next year's budget proposal.

There shouldn't be any surprise about this development. After all, why should high-tech fare any better than the war on drugs or any other policy initiatives limping out of the White House these days?

This columnist, for one, is more than happy that we don't have the federal government trying to prime the pump for the supercomputer industry. Sure, the national information network proposal, linking supercomputer centers around the country at high speeds, would be nice to have. But if the only way to get it is to have the U.S. government attempt to shore up the domestic supercomputer industry the same way it "protected" the steel industry, let's "Just say no!"

Unless you've been hiding out under a rock, you should realize by now that there really is not much of a supercomputer industry to prop up, anyway.

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Inside

- TI workers flock to early retirement offer. Page 114.
- Leading Edge reorganizes. Page 115.
- DEC asks who wants to sever themselves voluntarily. Page 118.

Stratus trims Q3 projections

BY RICHARD PASTORE
CW STAFF

MARLBORO, Mass. — Stratus Computer, Inc., one of the gung-ho gang of fault-tolerant players and virtually the last remaining unblemished computer firm in Massachusetts' Rt. 128 high-tech zone, last week scaled back its third-quarter growth and revenue projections by 10 percentage points and $6 million, respectively.

Stratus, which specializes in fault-tolerant, on-line transaction processing (OLTP) systems, announced that it has revised its third-quarter revenue projection from $88 million down to $82 million. It also shaved $2 million from its original net profit expectation of about $10 million. In reaction, Stratus' stock value plunged more than 22% last week.

President and Chief Executive Officer William Foster blamed the setback on a weak domestic market. "We are going to manage the company at the 20% to 25% growth level for the near term unless we see signs of improvement," he said. Stratus at first anticipated 30% to 35% growth over year-earlier levels. Foster said he expects to return to 30% growth by mid-1990.

STEVE SHERMAN

Stratus' Foster *scales back estimates*

OLTP is still one of the hottest hardware markets going, analysts agreed, although it is being roughed up by the competitive pressures that have hit the micro, mini and mainframe sectors.

Stratus got carried away by its past success, according to Michael Geran, an analyst at Nikko Securities Co. in New York. "They extrapolated a strong second quarter on the assumption that it would be that way all year long," he said. By reconciling its projections with market fact, the firm "has gone from Pollyanna to reality."

In related news, the Securities and Exchange Commission said last week that it will investigate the sales of shares by three Stratus officials that took place one month before the announced earnings revision.

Stratus spokesmen said no officials could have been aware of the revision at that time.

Datapoint chairman ups ante

BY PATRICIA KEEFE
CW STAFF

SAN ANTONIO, Texas — The fight for control of Datapoint Corp. escalated a notch two weeks ago when Chairman Asher B. Edelman boosted his group's stake in Datapoint from 10.5% to 40%, with the help of two subsidiaries that he controls.

Edelman's buying spree was prompted by attorney Martin S. Ackerman's attempts to unseat him and his board in a proxy fight in order to shift control of the company to Ackerman and his colleagues. Ackerman reportedly owns approximately 5% of Datapoint's 10 million shares of common stock.

"The feeling here is that if it was tough for Ackerman when Edelman only owned 10% of the company, what chance [of a takeover] does Ackerman possibly have now?" said a Datapoint executive who asked not to be named.

Ackerman has until Nov. 6 to secure the approval of more than 50% of Datapoint stockholders

Continued on page 118

Avanti tries comeback after total makeover

BY ELISABETH HORWITT
CW STAFF

NORWOOD, Mass. — After two years of flat sales, red ink and product glitches, Avanti Communications Corp. is attempting to resurrect itself with a self-improvement plan that is far more than just a face-lift.

"Avanti is a brand-new company now, since they have basically swapped out 80% of their staff in the last 18 months," said Richard Malone, a principal at Dedham, Mass., research company Vertical Systems Group.

In the past few months, the T1 switch vendor has acquired new management, additional financing, a new entry-level product, a revamped marketing strategy and a new headquarters location that is closer to strategic accounts than Avanti's former site in Newport, R.I., company spokesmen said.

The 13-year-old firm has been losing money during the past two years, primarily because of the cost of introducing and then debugging its Open Network Exchange (ONX) 5000, according to Robert Degan, Avanti's recently appointed president and chief executive officer.

Introduced in 1987, the high-end switch was a crucial part of Avanti's strategy for competing with such leading vendors as Network Equipment Technologies, Inc. and Timeplex, Inc. in the Fortune 500 market. But after selling the ONX 5000 to only seven customers, Avanti put further marketing plans on hold while it addressed software glitches that made the switch unreliable at times, Degan said.

A major milestone for Avanti was the release in June of new software that fixed the problem, Degan said. National Westminster Bank, which has suffered from routing glitches since it bought the ONX 5000 two years ago, has found the product to be "rock solid" since the new software was installed, said Brian Siegel, the bank's vice-president of data communications.

Making its high-end product viable was only one crucial piece of Avanti's game plan for becoming profitable by the fourth quarter. The company recently underwent a major reorganization, replacing four top managers and dismissing about 30% of its employees last July (see chart below).

Avanti has obtained $2.5 million in additional financing to take it through 1990, by which time the company hopes to have found a "corporate partner" that will provide Avanti with broader distribution channels as well as research and development funding, Degan said.

However, even with a powerful backer, Avanti will not try to compete again with the high-end switch makers for the Fortune 500 market; instead, it will target Fortune 2,000 companies and carriers, Degan said. The vendor has just announced a low-end T1 switch, the ONX 2000, for traffic needs of up to 16 T1 lines.

The main reason that Westminster Bank tried the immature ONX 5000 was that the product's "open architecture" fit into the bank's hybrid networking strategy, Siegel said. An important reason why the bank stuck with the switch was that Avanti responded rapidly when problems occurred, he added.

One possible Achilles' heel is the absence of a centralized, graphics-based network management workstation, Malone said. Avanti has been working on such a system with Bell Atlantic subsidiary Technology Concepts, Inc. and should deliver it next year, said Avanti Vice-President of Marketing Jack Kelly.

Self-help plan

Avanti Communications hopes steps taken in recent months will turn its fortunes around

- **January 1988:** President Tom Taylor resigns, followed in subsequent months by heads of engineering, sales and marketing
- **June 1989:** New software released to fix ONX 5000 glitches
- **June 1989:** Robert Degan appointed president and CEO; VPs of sales, engineering and finance hired. Approximately 30% of employees laid off
- **August 1989:** $2.5 million financing raised. First "break-even month" in two years
- **September 1989:** Entry-level T1 switch announced

CW CHART

IN BRIEF

Dear Diery

Apple Computer, Inc. announced last week that ex-**Wang Laboratories, Inc.** executive Ian Diery will succeed Delbert Yocam as senior vice-president and president of Apple Pacific. Diery, 39, an 11-year Wang veteran with extensive experience in international markets, most recently served as executive vice-president of Wang's worldwide field operations. In that post, he was responsible for Wang operations in Europe, Africa and the Middle East.

. . . .

Stumbling Block

H & R Block, Inc. has hedged its bid for **Microbilt Corp.**, the firm disclosed last week. After Microbilt turned in a lower-than-expected performance for the six months ended July 31, Block revised its bid, offering Microbilt shareholders $14 worth of Block common stock per Microbilt common share plus another $4 worth if Microbilt's earnings in the next 12 months exceed those of the last 12. Block had previously promised Microbilt shareholders $18 per share.

. . . .

Oracle joins Semi boosters

Oracle Corp. last week signed on with **Semi/Sematech,** an association of suppliers to the semiconductor industry dedicated to helping the U.S. regain its lead there. Oracle's role will be to provide Sematech-member semiconductor manufacturers with companywide integration via its distributed database management system.

. . . .

Landmark decision

Landmark Graphics Corp. announced that because of product confusion and consequent purchasing delays in the computer-aided exploration workstation market, it has lowered its current-quarter earnings projections from 24 cents per share to about 20 cents per share. To ease customer concerns about being burdened with suddenly outdated technology, Landmark has guaranteed its customers a free hardware upgrade to more advanced Landmark introductions within the following 12 months.

. . . .

Adobe checks in

Adobe Systems, Inc. announced robust earnings growth for its third quarter ended Sept. 1. Revenue was $30 million, up 19% from the year earlier. Net income was $9.1 million, an increase of 43% over last year's like quarter. The company noted that Apple accounted for slightly less than 25% of its total revenue for the quarter.

Too many takers for TI's early retirement bid

BY ELLIS BOOKER
CW STAFF

DALLAS — A voluntary early retirement offer that attracted more takers than expected will cost Texas Instruments, Inc. about $10 million in the third quarter, the company told a group of Dallas investment analysts two weeks ago.

The retirement scheme, announced in August by TI's Defense Systems & Electronics Group, was part of a work force reduction that included the layoff of 130 people at the company's metal fabrication operation in Colorado Springs, Colo., and the termination of 100 additional employees at facilities elsewhere around the U.S. Another 200 to 400 employees had been expected to take the early retirement and termination package. However, approximately 700 signed up for the program, which ended Aug. 25.

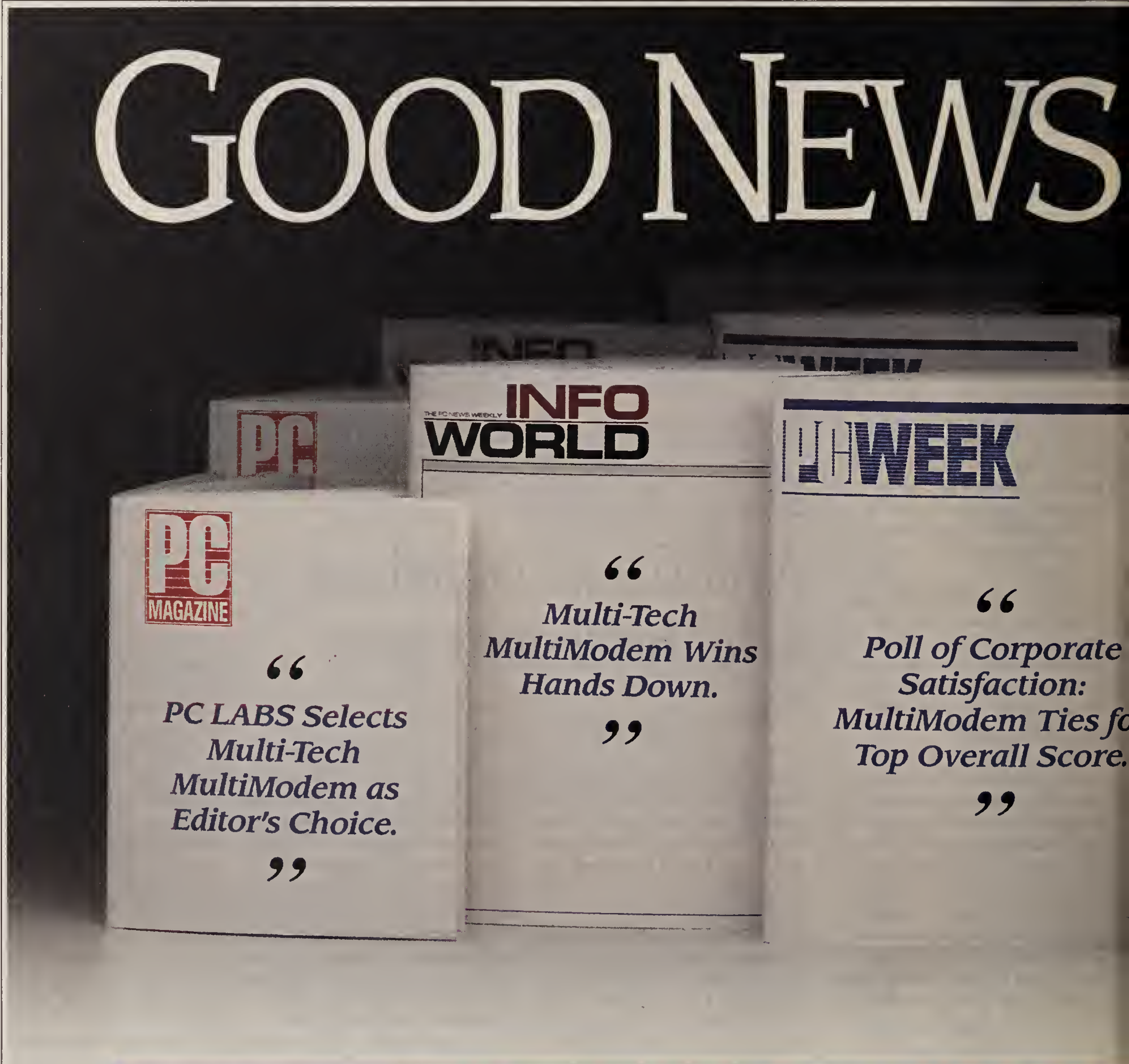
Staff cuts needed

More significant than the third-quarter charge was the need to cut staff in the first place, analysts said.

"It represents a continuation of sluggish revenues and earnings pressure in the military electronics area," said James L. Barlage, managing director of research at Smith Barney, Harris Upham & Co. in New York.

Barlage, who estimated the third-quarter charge to be about 10 cents per share, described TI's defense and electronics group as "one of the most dynamic areas over the past 10 years" and said compounded annual revenue for this operation averaged 17%, far outpacing the 7% growth for the rest of the company.

However, given political pressure to pare down the U.S. defense budget and an apparent thawing in the Cold War, this growth pattern cannot be sustained, Barlage said. "In my view," he concluded, "the best you'll get out of this area is flat growth."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Daewoo pulls Leading Edge away from bankruptcy brink

BY ALAN J. RYAN
CW STAFF

CANTON, Mass. — It was cheap champagne for everyone when Leading Edge Products, Inc.'s reorganization plan was approved by U.S. Bankruptcy Court Chief Judge James N. Gabriel in Boston recently.

Leading Edge had been operating under Chapter 11 bankruptcy protection since February. Under the terms of the plan, which will take effect in mid-October, the more than 400 creditors will be paid 100% of what they are owed in Leading Edge products over the next four years. The plan will be funded by Daewoo Telecom, Inc., the South Korea-based manufacturer of Leading Edge personal computers.

According to Daewoo Telecom's business plan, Leading Edge expects to increase its revenue to $500 million in five years. During the most recent 3½ years, Leading Edge sold $470 million of the Daewoo products. Daewoo Telecom is a subsidiary of the $13 billion Korean conglomerate Daewoo Corp.

Dealers' edge

Most of the Leading Edge creditors are dealers, and they approved the plan with a nearly unanimous vote, according to John R. Sullivan, the newly appointed chief operating officer of Leading Edge.

The dealers will be paid 25% in products soon after the effective date of the plan and will then receive 18.75% in products owed on each subsequent anniversary for four years.

With the confirmation of the business plan, Leading Edge will now move to actually put it into effect. Approvals from the South Korea ministry of trade and other U.S. government approvals are in process, Sullivan said. Such approvals "give Daewoo Telecom the opportunity to move cash from South Korea into the U.S., which will be used for the first wave of payments to creditors," he said.

Leading Edge, once a highly visible and profitable clone maker, had accumulated debts of $16.5 million by February. Sullivan said last week's approval from Gabriel was a positive step toward his goal of seeing the company once again become a major player.

Last week, though, the celebrators at the company's Canton headquarters had to settle for inexpensive champagne. "We're not out of the hole yet," Sullivan said.

Bartolik

CONTINUED FROM PAGE 113

Cray Research, in fact, has very little domestic competition for the very few supercomputer customers. Rather than effectively subsidize a domestic monopoly, let's let this niche industry take on a little foreign competition, or even a lot.

And if it can't keep up with the NECs and Fujitsus of the world? C'est la vie!

U.S. industry has already turned up its nose at the promise supercomputers supposedly hold. The bigger-is-better mentality has gone the way of the New Deal, with smaller, more powerful technology providing a plethora of computing alternatives.

Well, some will argue, what about the needs of our secret intelligence agencies and other vital government bodies that rely on Crays for unique processing functions? Too bad! There are plenty of new technologies under development that could use what is effectively the subsidy that government business has provided Cray over the years. Cray is not in any sense of the word a strategic start-up, and it's time for it to stand on its own two feet; if it can't, then the machines it provides may not be a cost-effective tool for government agencies, anyway.

The current clamor to protect our domestic supercomputer industry — and if you read between the lines, it is clearly a call to protect Cray — is an argument that this industry doesn't have what it takes to go it alone. Government protection, one way or another, amounts to government subsidization.

This is not to say that the U.S. government should not use its vast procurement pockets to assist budding domestic technology wunderkinds. Government funding has always been a valuable resource for technological start-ups, but at some point such ventures have to be able to make a go of it in the commercial world.

Here's one taxpayer that would just as soon not see the federal bureaucracy bogged down in a wrangle about the merits of whether we need to browbeat the rest of the world over a very selective niche of the computer industry.

The effort would be much better spent trying to resolve issues that really mean something to the social fabric of the country, such as the war on drugs, homelessness or assisting the democratization of Iron Curtain countries. Tell Bush, in a nice way, to put the money where it counts.

Bartolik is *Computerworld's* news editor.

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Datapoint

FROM PAGE 113

for his bid to wrest control from Edelman.

In a press release issued earlier this month, Ackerman, who is chief executive officer of a computer distributorship, Authorized Distribution Network, Inc., claimed that his team could do a better job than Edelman has done in returning Datapoint to profitability.

The local-area network supplier recorded seven consecutive profitable quarters before incurring a $20 million loss in the third quarter of fiscal 1989. The fiscal year ended July 31, and Datapoint is expected to release year-end and fourth-quarter results within two weeks.

Ackerman filed a Schedule 14B petition with the Securities and Exchange Commission (SEC) earlier this month charging that since Edelman took over Datapoint in 1985, the firm has seen the value of its stock plummet 58%, its bottom line gush red and its coffers tapped for speculation in other companies' securities. The inconsistency between the seven profitable quarters and Ackerman's charges of red ink is explained in part by the fact that Datapoint's board consistently votes dividends on preferred shares. For example, last year's $9.8 million dividend payment wiped out an $8 million net profit for the year, the source confirmed.

The battle, complete with dueling SEC filings, has the odd effect of turning the tables on arbitrageur Edelman, who ordinarily casts himself in the role of the aggressor. Edelman, a well-known raider who tends to purchase companies and then sell off various units in order to reap a tidy profit, could not be reached for comment.

Edelman successfully engineered a hostile takeover of Datapoint in July 1985, later spinning off the firm's service business as a separate company called Interlogic Trace, Inc. He retained chairmanship of significant equity positions in both firms.

A leveraged buyout attempt for $6 per share followed in September 1985 and was later withdrawn in May 1986. In April 1988, Edelman, backed by a group of management-level executives and investors, took a second stab at soliciting a buyout, also for $6 per share. That offer was also rejected.

Since purchasing Datapoint, Edelman has continued his investment activities through a separate firm called Arbitrage Securities Co.

DEC offers voluntary severance

BY MARYFRAN JOHNSON
CW STAFF

MAYNARD, Mass. — Hoping to trim its ranks of 700 manufacturing employees in New Hampshire and Massachusetts, Digital Equipment Corp. earlier this month offered a voluntary severance plan to encourage people to leave the company.

Employees at a DEC manufacturing facility in Salem, N.H., and a half-dozen associated business units were gathered in small groups and told about the "fifth option" — a financial support package offering from 40 to 104 weeks' pay, one year of insurance coverage after they resign and help in finding a new job.

"There is no intention of having this become a companywide program," said Jeffry Gibson, a DEC spokesman.

DEC is in the midst of shifting 4,000 employees away from manufacturing and into sales and service. The four other options being offered are redeployment to another job, retraining, temporary assignment or additional education and training courses.

Within the past year, the DEC facility in Salem was "rechartered" from its original use as a final assembly and testing plant to a home for the computer special systems manufacturing group. Since November 1988, some 600 employees in the assembly and testing unit have moved on.

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COMPUTER CAREERS

The LAN manager steps out

Onetime renegades are now assuming an increasingly central IS role

BY AARON BRENNER
SPECIAL TO CW

In response to the tremendous growth of enterprisewide networks, U.S corporations have added a new title to the information systems structure — LAN manager. IS departments are scrambling to keep up with the new technology, develop the latest applications and manage the vast, decentralized set of resources being installed on their networks. These efforts require the full-time attention of a management-level person. That is where the local-area network manager comes in.

One measure of the growing importance of LAN managers is the expanding corporate budget for LAN management products. According to a recent study by Infonetics, Inc., a Santa Clara, Calif., market research and consulting firm, Fortune 500 companies will spend an average of $440,000 on network management products in 1991. That represents an increase of more than 75% from the $250,000 being spent this year.

Are companies making an equivalent commitment in terms of personnel? The answer is yes, but slowly. The demand for qualified LAN managers is growing and will continue to rise as networking grows, but there are few managers with broad technical experience in the field. The supply of LAN managers is therefore growing at a snail's pace, providing great opportunities for people entering the field now and in the near future.

Few LAN managers actually hold that title. They go by such names as principal research specialist, information center analyst and manager of systems design. Nonetheless, these people are doing the same basic job. They manage their company's network resources.

What this means in practice can vary, however. Ask 10 LAN managers what they do on a day-to-day basis, and you will get 10 different answers. In some cases, the LAN manager is strictly a personal computer person. At other companies, he is responsible for integrating the entire range of computing power. In virtually all cases, the LAN manager is a jack of all trades. "The experience necessary in this field is generalized. It requires knowledge of a number of platforms," says Glenn Fund, a principal research specialist at defense contractor Sanders Associates, Inc., in Nashua, N.H., and director of the Greater Boston area Novell Users Group.

"It used to be that there was the VAX group, the IBM group, the PC group and so on," Fund says. "Each did their own thing, and seldom the twain did meet. For LAN managers, all the platforms are fair game."

Fund suggests knowledge in telecommunications, cabling, connectors and modems is a good start for a LAN manager. It might not be necessary to know every application, but one must be able to talk to users about them, he adds: "On PC networks, you have to know batch files, operating systems and the PC inside and out."

> "IT USED TO BE that there was the VAX group, the IBM group, the PC group and so on. Each did their own thing, and seldom the twain did meet. For LAN managers, all the platforms are fair game."
>
> GLENN FUND
> SANDERS ASSOCIATES

LAN managers rarely receive formal education in the field. Instead, they learn through on-the-job experience. However, two organizations have made a move to define more clearly what a LAN manager does and to provide the necessary education.

Bellcore, the research arm of the divested Bell operating companies, and Carnegie Mellon University in Pittsburgh, Pa., have established the Information Networking Institute, which offers a master's of science degree in information networking.

The program is the first of its kind, according to institute director Alex Hills. Students receive training in telecommunications, computer science and business. "In this field, people tend to get pigeonholed," Hills says. "We are trying to create a new discipline, a new type of graduate who is comfortable in any of the three areas and is in command of information networking as a discipline."

There already are a few common points of reference that help define LAN managers and what they do. One of the most important is an appreciation for overall systems design.

"I have designed mainframe systems from scratch," says the LAN manager at a Midwestern state government agency. "I have gone through the textbook systems development phases." Some PC experts may lack such experience, he says, but it is crucial for a LAN manager. The basics of systems analysis aid LAN managers when linking multiple computing platforms.

Another common characteristic is independence. Although IS departments are increasingly involved with LAN installations, the first networks were installed by mavericks working in user departments. These ersatz LAN managers saw networks as a liberating alternative to mainframes. That sense of freedom still permeates the ranks of LAN managers today.

Such independence carries with it some uncertainty, however. At this point, there is no definitive career path for the networking guru. Movement through a corporation may be more horizontal than vertical, as department after department gets wired up. Alternatively, the company might take a more global approach and centralize its networking staff.

More IS managers are discovering that networks are becoming the backbone of corporate computing resources. As they do so, someone has to understand how they operate, what applications they can run and how they can contribute to the bottom line. There are a handful of LAN managers filling that need today, and more of them will be required.

Brenner is a free-lance writer in New York and author of the book *OS/2 LANs*.

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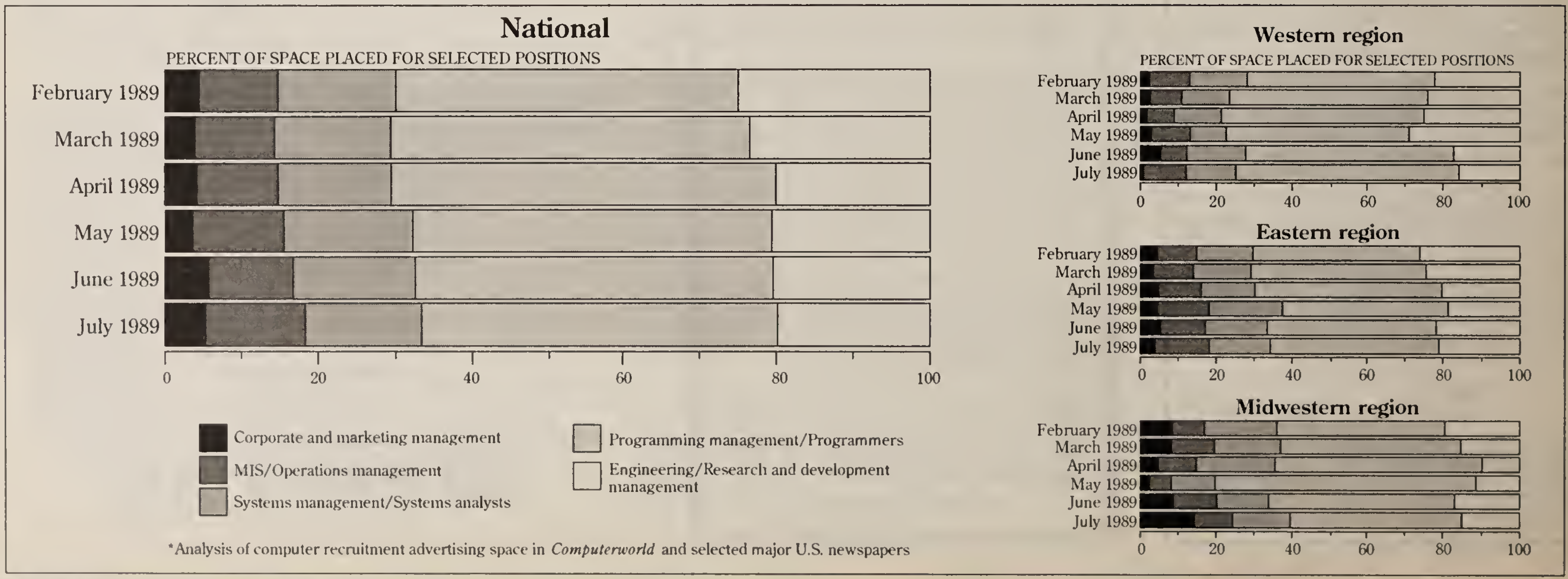

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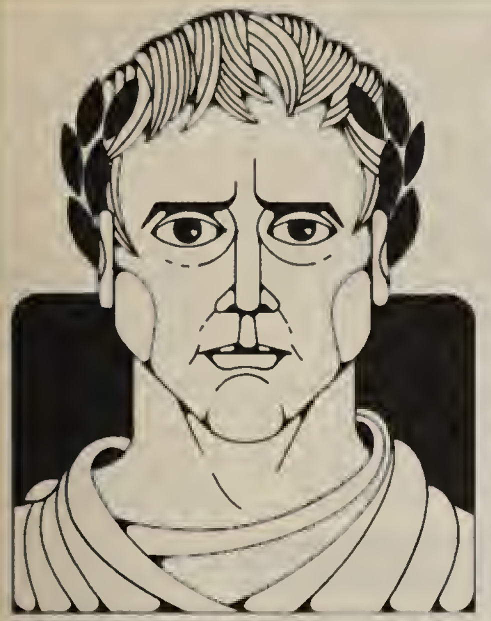

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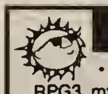

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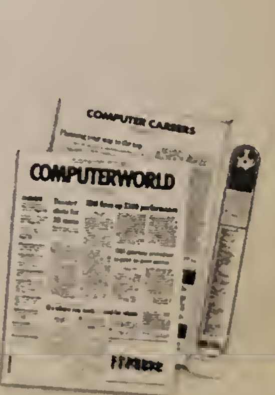

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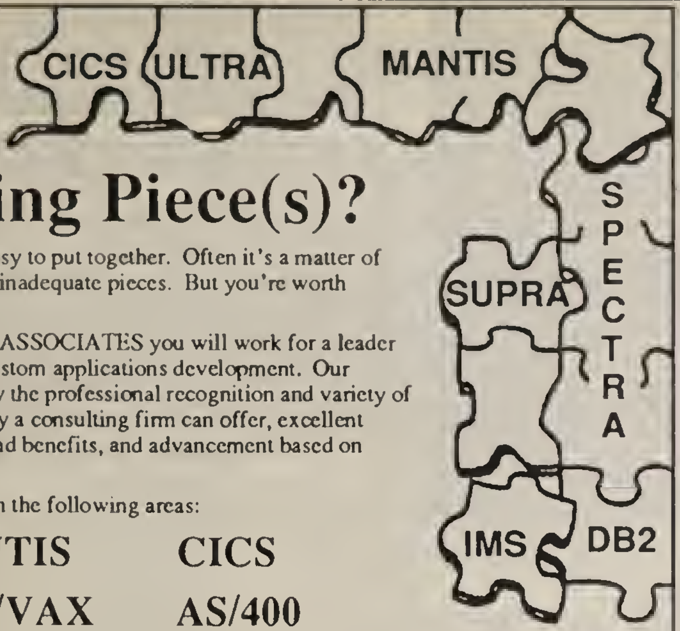

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Will provide software support for TWA's IMS and CICS systems. Knowledge of MVS, JCL, SMP/E. BAL coding skills, with internals knowledge of either IMS or CICS also a requirement.

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Current working knowledge of COBOL IMS DB/DC applications programming to be used in the development of business systems. Structured systems analysis, design and construction methodologies desired. Minimum 3 years experience in a data processing environment required.

DEVELOPMENT CENTER ANALYST

This individual will provide technical support to applications developers in the use of development languages and testing tools. Will be required to develop machine/human interfaces to simplify the use of tools by application developers. Minimum 5 years experience in applications development with knowledge of COBOL, ASSEMBLER, and TSO/ISPF Dialog Manager.

OPERATIONS RESEARCH ANALYSTS

Must have strong analytical background. Will be responsible for analyzing, programming, and implementing data processing techniques to solve complex operational and planning problems. Linear programming, regression analysis, sampling, simulation, and forecasting experience is required as well as the ability to program using a high-level language (PL/1, SAS, Fortran, C or Pascal).

DATA ADMINISTRATION ANALYSTS

Knowledge of DA concepts, information engineering techniques and C.A.S.E. tools. Experience in Entity Relationship Modeling and general knowledge of DP environment required, IEF helpful.

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Experience in evaluating, consulting and training on mainframe decision support tools such as DB2, QMF, FOCUS, INTELLECT and Host Graphics; or Microcomputer hardware and software products, including Local Area Networking.

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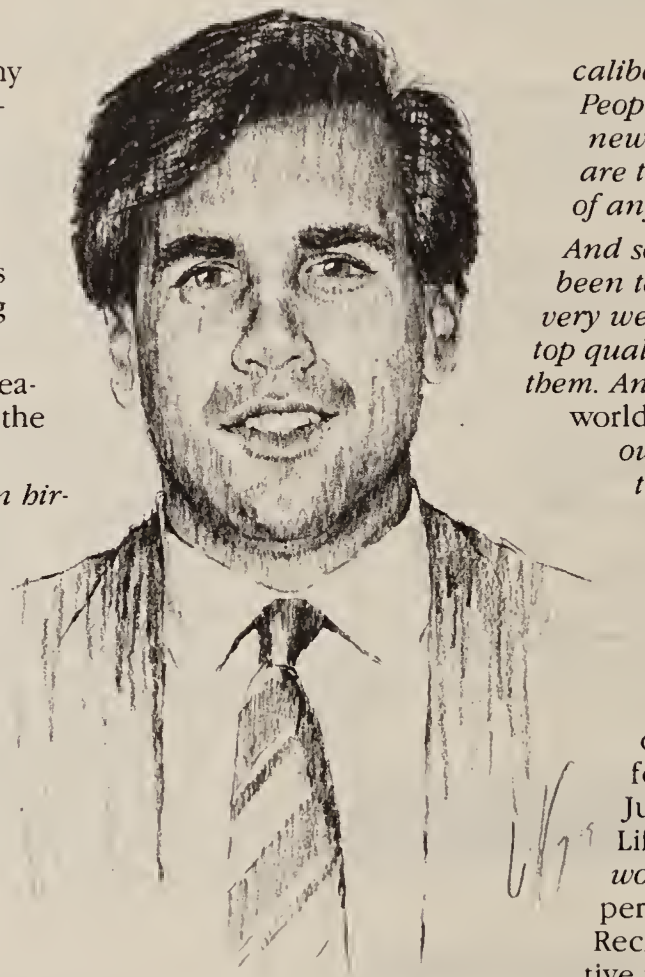

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Thiokol Corporation, a leader in the research, design, manufacturing and testing of solid propellant rocket motors, has a challenging opportunity for a DEC networking (LAN) Specialist.

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SR. TPF PROGRAMMER ANALYST required. Sr. Designer of new applications development systems architecture for construction of new computerized reservations system to service the needs of the hotel and car rental industry. Operating system to be designed in TPF and DB2 environment using ACP/TPF and IMS/DB2 development tools. Will design front end processor switch for common-user interface and dialog manager. Will perform extensive data modeling functions and create relational databases to support decision processing. Software architecture is to be supported by IBM Expert System Artificial Intelligence (AI) processors with connectivity and compatibility so that applications are portable between the TPF, DB2 and AI environments. Will lead team of applications development analysts and coordinate activity in all three environments.

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Diagnostics Engineer in an Advanced Diagnostic/Systems Engineering Group. Responsibilities will include analyzing hardware design specifications plus schematics and defining, designing, implementing and supporting detailed tests to simulate the hardware design functionality. Verification of special VLSI chips on a software simulator for hardware. Creating test vectors for VLSI chip testing and fault simulating the chip design. Further responsibilities include writing detailed functional and design specifications for ROM Based Diagnostics for the actual hardware at chip, module and system levels. Participate in debug of the hardware using a variety of lab equipment including oscilloscopes and logic analysers. Requirements for this position are: MSEE or MSCS with a background in testability and diagnostic areas of VLSI chip design. Knowledge of microprocessor and C programming languages, microprocessors, VLSI design tools, simulation techniques for VLSI systems, test generation and fault simulation of VLSI chips, VAX architecture, VMS and Unix operating systems is required. Knowledge of reliable systems and Fault Tolerant systems is required. No experience required. 40/HR WEEK, 8:15 A.M. - 5:00 P.M. Salary 34,000 to 37,000. If you are interested in, and qualified for the above position, please forward your resume to: Massachusetts Division of Employment and Training, Special Programs Department, 19 Staniford Street, Boston, MA 02114, Case #91363

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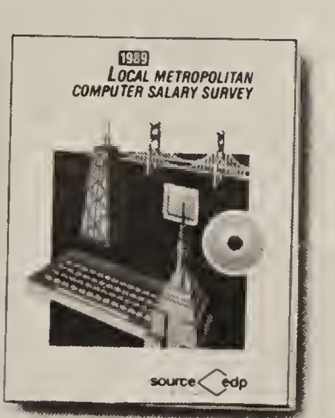

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Several positions at all experience levels are available for software engineers. Using structured development techniques and advanced design automation tools, you will develop applications and platform elements for CHC's products. A degree in Computer Science or Engineering is required with advanced training desirable. The ability to interact with clients, define requirements, develop software architectures and designs, test, document and support systems are all attributes of these assignments.

Experience with fault tolerant platforms, UNIX operating systems, high-order languages such as Fortran, C, PL/1, and Pascal is an advantage. Exposure to workstation technology, graphical user interfaces network protocols, mini or micro platforms or conventional healthcare applications will further qualify the candidate.

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A senior position is available for a data base architect/administrator with a Computer Science degree and 5-10 years experience in database development. Responsibilities include identification of DBMS solutions for CHC's products and design of distributed data base applications. Exposure to Oracle, Ingress, Sybase or related products and experience with use of this technology is desirable.

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Entry level and experienced personnel are needed to perform software tests and verification. You will create detailed test plans/procedures, conduct integration and system test operations, participate in product and configuration management reviews and provide guidance in all development phases to insure quality products.

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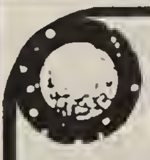

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The National Radio Astronomy Observatory seeks a Programming Analyst at its Green Bank, West Virginia site to support the upgrading and expansion of its computing facilities in connection with the construction of a new radio telescope. Duties will include managing and operating a computer network, maintaining and developing astronomical software packages, developing data analysis procedures, advising on the purchase of computer hardware and software, and planning of the next-generation single-dish analysis system.

Knowledge of advanced workstation concepts and networking is essential, along with experience with UNIX operating systems and C and FORTRAN languages.

An advanced degree in a relevant scientific or engineering field is preferable, although equivalent experience will be considered. Programming experience in a scientific environment is desirable.

Candidates should send resume, bibliographies, and a letter detailing relevant experience and outlining computer or research interests to:

Dr. George Seielstad
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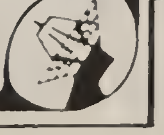

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MARKETPLACE

Putting systems out to pasture

To get rid of an old computer, users have several options at their disposal

BY MICHAEL ERBSCHLOE
SPECIAL TO CW

If you are planning to buy a new computer, you not only have to determine the best way to finance your new machine, but you must also decide how to dispose of your current one.

In making the decision, you will probably be dealing with equipment that falls into one of three categories:

- It is very old and has little, if any, value.
- It has been completely depreciated but has some value.
- It has not been completely depreciated, and you may still face lease payments or other financial obligations on it.

Equipment is generally defined as obsolete if maintenance for it is no longer available from the original manufacturer, third-party maintenance is getting more expensive and replacement parts are becoming harder to find. In this situation, you may find that it will cost more to have your equipment removed than to dispose of it yourself. However, there are some options to consider.

Some companies donate old equipment to schools or charitable groups. The organizations usually cannot use the systems but sell them to raise funds. Do not be surprised if such offers are not met with a positive response, however. Not all of the organizations possess the skills or the knowledge to deal with such a contribution. Nevertheless, the approach is still worth checking into.

In addition, there is an emerging group of computer equipment scrap dealers that may be interested in your system. Several of them advertise in trade publications. Depending on your equipment, you may find they pay fairly well for old machines.

The dealers concentrate on systems that were very popular and are still in use, kept alive by third-party maintenance firms. The IBM Series/1 and System/34, 36 and 38 are prominent examples, as are the older Digital Equipment Corp. PDPs. The recyclers dismantle the machines and sell parts to the maintenance companies.

Middle-aged equipment

Selling middle-aged equipment can be more of a challenge. If the installed base for a system is small, it actually falls into the obsolete category.

For more popular machines, there might be other users interested in an inexpensive source of parts or replacement peripherals. These users are likely to be found among midsize manufacturers that use the systems for production or related jobs such as inventory control. Interested companies are generally satisfied with the equipment and do not want to spend money on upgrades or conversions. They often use small DEC VAXs, IBM System/34, 36 or 38s and 4300s or older Hewlett-Packard Co. equipment.

Start-ups may also be interested in such systems because the owners have the skills and knowledge to use them and little money to invest in the latest technology. Informal networks may be the best source of information on these opportunities.

> IF YOU ARE REPLACING equipment that is not completely paid for or depreciated or that retains some cash value, your situation can be much more complicated.

Newer equipment

If you are replacing equipment that is not completely paid for or depreciated or that retains some cash value, your situation can be much more complicated.

Your company may only upgrade a system — rather than replace it — in order to lengthen its useful life and obtain some of the benefits of newer technology while delaying conversion costs and disposition difficulties. This approach would leave you with just a few pieces of equipment to dispose of and thus fewer headaches; however, it would also lower the trade-in or cash value of that equipment because of the small scale of the transactions.

In practical terms, there are three ways to dispose of computer systems that fall into this final category:

Cash sale. The advantages of this approach are immediate cash in hand and ease of negotiation and administration. The disadvantages are a potential loss of federal investment tax credits, unacceptable book losses or a low return if you do not have the time to find a buyer that will pay you a good price.

Sublease. Subleasing computer equipment is usually done through a broker, dealer or third-party lessor. Its advantages are avoiding a large lease termination payment or book loss. However, subleasing does not provide the cash to immediately reinvest in new equipment.

Trade-ins. A trade-in avoids the need to report or realize large cash or book losses. On the other hand, it may add to expenses if the interest under the refinancing is greater than the rate due under your previous lease contract.

However, you may be able to use a trade-in to exert leverage with manufacturers that want to sell new equipment and discontinue maintenance of older systems. These manufacturers often make special allowances for trade-ins when they want to push new technology, increase revenue or avoid the need to hire maintenance workers for new systems by eliminating the ones they currently support.

Erbschloe is a managing editor at Computer Economics, Inc. in Carlsbad, Calif.

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The BoCoEx index on used computers

Closing prices report for the week ending September 15, 1989

	Closing price	Recent high	Recent low
IBM PC Model 176	$500	$625	$400
XT Model 086	$725	$1,150	$700
XT Model 089	$1,025	$1,400	$950
AT Model 099	$1,525	$1,850	$1,400
AT Model 239	$1,700	$2,100	$1,700
AT Model 339	$1,750	$2,000	$1,700
PS/2 Model 50	$1,675	$2,000	$1,600
PS/2 Model 60	$2,625	$3,300	$2,500
Compaq Portable I	$475	$750	$325
Portable II	$1,700	$2,000	$1,650
Portable III	$2,425	$2,800	$2,200
Portable 286	$1,600	$2,000	$1,600
Plus	$750	$1,200	$675
Deskpro 286	$2,025	$2,350	$1,700
Deskpro 386	$2,750	$2,900	$2,500
Apple Macintosh 512	$500	$650	$300
512E	$550	$925	$450
Plus	$1,050	$1,150	$750
II	$3,100	$4,175	$2,500
Zenith 183	$1,375	$1,400	$1,175
Apple IIGS dual floppy	$1,325	$1,575	$1,175

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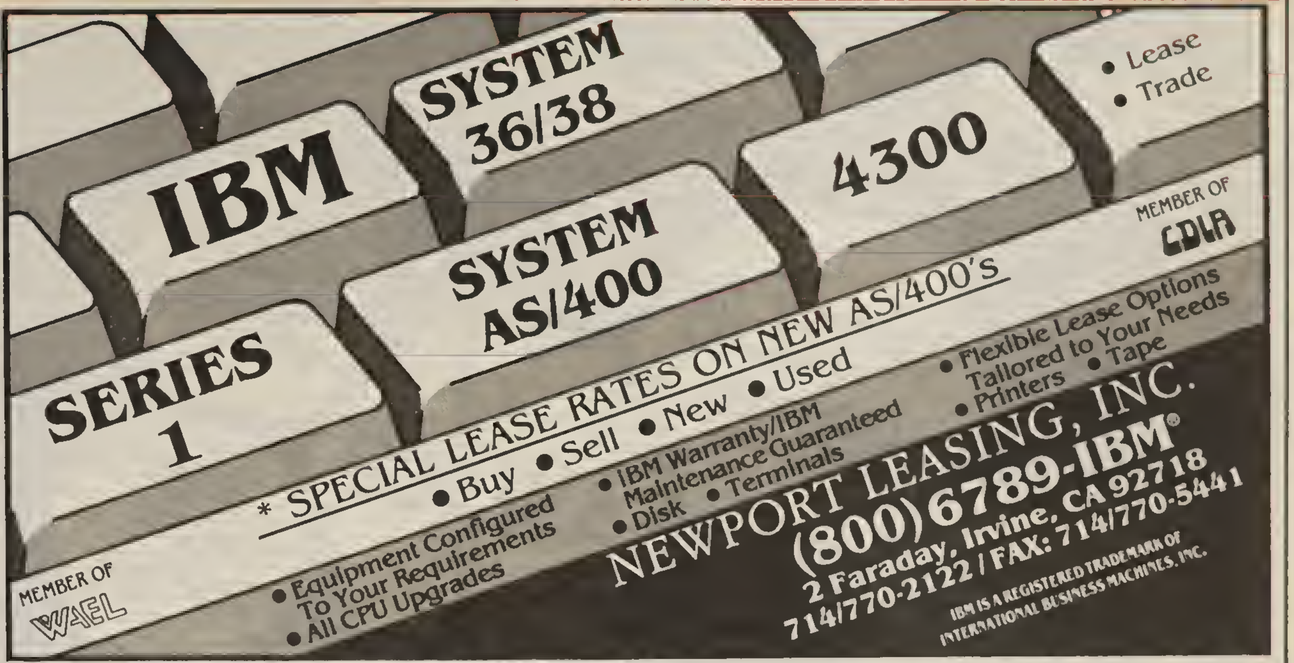

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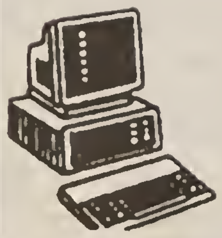

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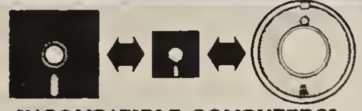

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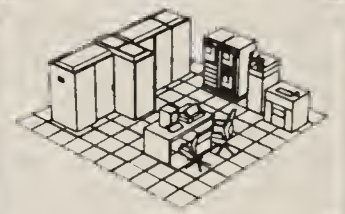

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REQUEST FOR PROPOSALS
NAPERVILLE'S MINI-COMPUTER SYSTEM

The City of Naperville, Illinois does hereby invite sealed proposals for the purchase of a mini-computer system.

Proposals will be received at the City of Naperville, Purchasing Division, 175 West Jackson, P.O. Box 3020, Naperville, Illinois 60566-7020 until 4:00 p.m., local time, Monday, October 16, 1989.

There will be a vendor's conference on Monday, October 2, 1989 at 2:00 p.m., local time, in the Council Chambers at 175 West Jackson Avenue, Naperville, Illinois.

There will be a charge of $75.00, non-refundable, for each proposal package.

The successful bidder will be required to furnish Performance and Payment bonds in the amount of 100% of the final contract sum.

The City of Naperville reserves the right to reject any and all proposals.

J. Craig Blomquist
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Sealed proposals will be received by the CDPA, 301 N. Lamar St., 301 Building, Suite 508, Jackson, MS 39201 for the following equipment and services:

Request for Proposal No. 1655, due Tuesday, October 10, 1989 at 3:30 p.m. for the acquisition of an upgrade to an existing local area network for the MISSISSIPPI STATE BOARD OF CONTRACTORS.

Request for Proposal No. 1656, due Wednesday, October 18, 1989 at 3:30 p.m. for the acquisition of a local area network for the DEPARTMENT OF EDUCATION.

Request for Proposal No. 1657, due Tuesday, October 10, 1989 at 3:30 p.m. for the acquisition of fifteen terminals, various peripherals and software for a Wang Model 5460 minicomputer for the MISSISSIPPI PUBLIC SERVICE COMMISSION.

Request for Proposal No. 1660, due Monday, October 9, 1989 at 3:30 p.m. for the acquisition of upgrade components for an existing local area network for the LAW ENFORCEMENT TRAINING ACADEMY.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to reject any and all bids and proposals and to waive informalities.

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TRAINING

Expert systems as teachers

They can lend a whole new meaning to the concept of on-the-job training

BY JESSICA KEYES
SPECIAL TO CW

In this age of business flux and changing lifestyles, it is not unusual to find companies plagued by double-digit turnover and the consequent skyrocketing of training costs.

One possible response to this kind of instructional need is intelligent computer-assisted learning (ICAL), touted as a new artificial intelligence version of computer-based training (CBT). ICAL provides individual instruction, immediate response for remedial learning and reinforcement and measurement of student replies.

However, senior management might cringe at the bill. According to Behaviortech, Inc., an Oak Brook, Ill., vendor of CBT, ICAL development costs can exceed $8,000 per course hour. Off-the-shelf CBT, by contrast, might cost less than $100 per course hour.

Fortunately, there is an alternative to ICAL — expert systems. One of the main selling points for expert systems technology is its role as advisor; in fact, many of the systems are so dubbed. Examples include NCR Corp.'s Design Advisor for developing integrated circuits and Du Pont Co.'s Packaging Advisor for creating plastic food containers. Technology is already available to do battle with a lack of knowledge, even if it was not originally intended for training.

How can companies put expert systems tools to work in training? The key to building good training systems is to provide not only the "how" but also the "why," and expert systems can do this rather nicely.

Built into most expert system shells are two features typically known as "explain" and "why." Their use can be illustrated by an advisory system for training new warehouse supervisors in the intricacies of restocking. Neophytes could press the "explain" key to learn more about inventory reordering formulas. They could hit the "why" key when the system asks questions about, for example, the weather or the location of the warehouse: It turns out that customers make bigger purchases in the fall in, say, the Southeast.

These expert systems, or real-time training systems, are also being used to great advantage in such far-flung disciplines as credit authorization, tax advising, mortgage authorization and even financial market regulation.

> HOW CAN companies put expert systems tools to work in training? The key to building good training systems is to provide not only the "how" but also the "why," and expert systems can do this rather nicely.

But why use expert systems? Why not CBT, especially now that it is powered by artificial intelligence in the form of ICAL?

A large percentage of CBT is aimed at teaching the use of such personal computer applications as spreadsheets, databases, communications packages and others. These are the new tools of business, and CBT often works well with them.

However, there is another type of training challenge. Imagine for a moment a new crew of trainees who have been sent off for a week of CBT instruction on the tools of the trade. A week later, they arrive at their offices to discover a frantic work pace — telephones ringing, meetings on the hour — and no time for training. They have to perform, now.

We are talking about the knowledge of the trade rather than its tools, and it must be absorbed in real time. In this environment, CBT does not cut the mustard.

The secret behind expert systems is that they permit the encoding of knowledge rather than just data. Expert systems come in many forms. For example, rule-based systems capture knowledge in the format of if-then rules. Examiners at the New York Stock Exchange use such a system for financial analysis of the brokerage firms that are members of the exchange.

A user of this system, for example, might need to examine whether there was a problem with the value of the stocks a brokerage was holding compared with the brokerage firm's net capital. One rule calls for entry of the names of the stocks held, generates their current market value and compares that amount with the net capital.

If a veteran user is asked what stocks are being held, he quickly responds because he knows the techniques of financial analysis. A novice, on the other hand, presses the "why" key on his terminal and the system explains why the question is being asked. The novice feels a little better — he now understands and gives the answer. When the system responds that there is a problem, the novice presses the "how" key and the system explains how it arrived at the conclusion — real knowledge in real time.

The training designer has many choices. Expert systems can provide a real-time approach to taming the training beast within the context of the real work that has to get done.

Keyes is managing director of technology for the New York Stock Exchange and a frequent contributor to technology publications.

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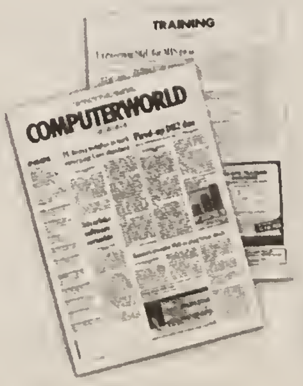

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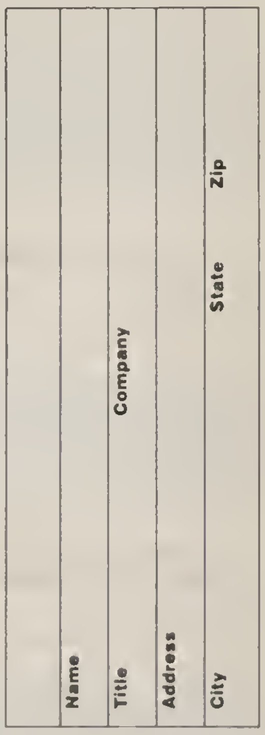

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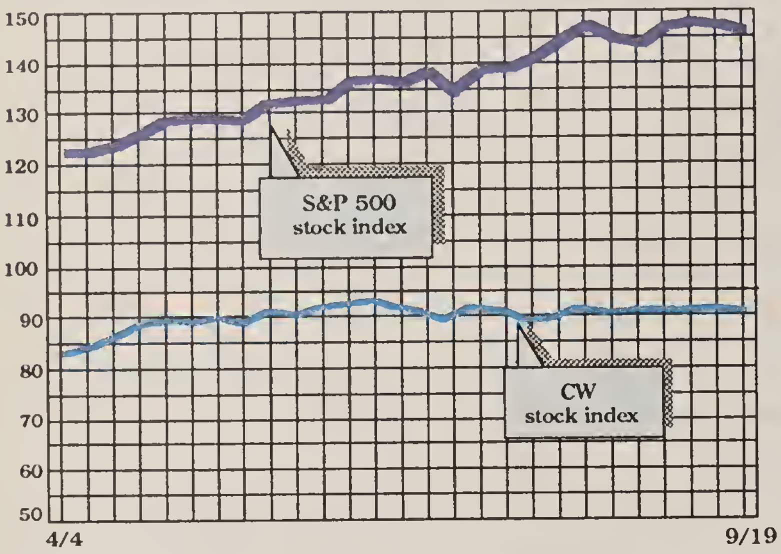

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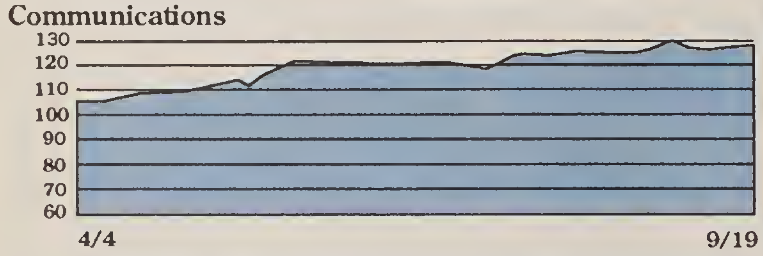
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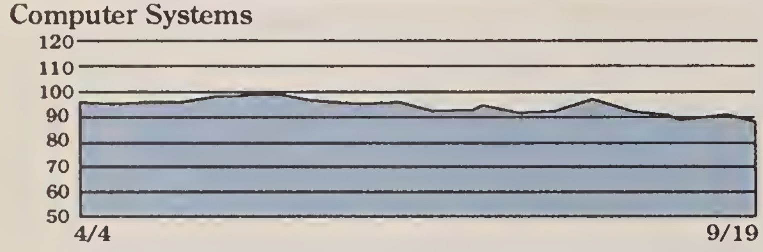
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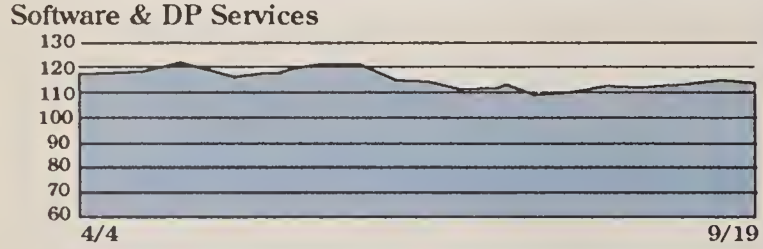
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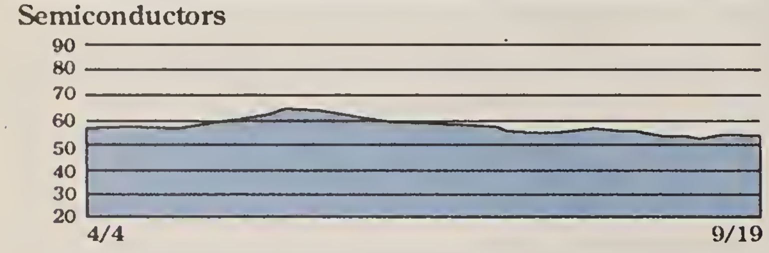
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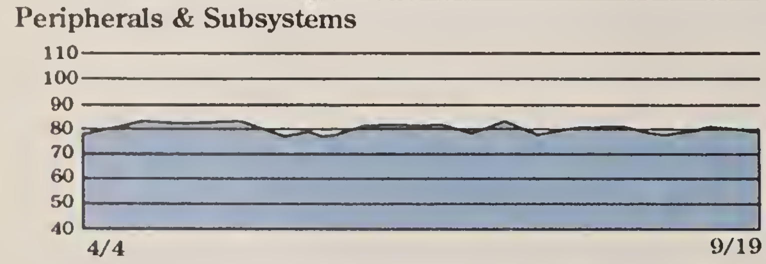
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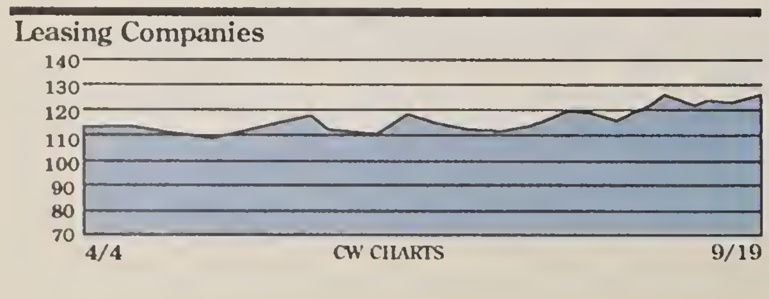
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CLOSING PRICES WEDNESDAY, SEPT. 20, 1989

Communications and Network Services

EXCH		52-WEEK RANGE		PRICE CLOSE SEPT. 20 1989	WEEK NET CHNGE	WEEK PCT CHNGE
N	AMERICAN INFO TECHS CORP	63	46	63.25	3.1	5.2
Q	ANDREW CORP	26	16	24	-0.3	-1.0
Q	ARTEL COMM CORP	9	2	8	0.1	1.6
N	AT&T	42	26	41.875	1.9	4.7
Q	AVANTEK INC	7	4	5.75	-0.6	-9.8
N	AYDIN CORP	20	13	19.625	1.1	6.1
N	8ELL ATLANTIC CORP	100	69	98	2.0	2.1
N	8ELLSOUTH CORP	55	39	54.375	2.4	4.6
Q	COMPRESSION LABS INC	11	3	10.125	0.4	3.8
Q	COMPUTER NETWORK TECH	3	1	2.594	-0.1	-2.4
Q	CONTEL CORP	35	18	33.375	0.1	0.4
Q	DATA SWITCH CORP	7	4	3.875	-0.3	-6.1
Q	DIGITAL COMM ASSOC	26	17	20.5	-0.8	-3.5
Q	OYNATECH CORP	21	17	19.5	-0.4	-1.9
Q	FI8RONICS INTERNATIONAL INC	7	3	6	-0.1	-2.0
Q	GANDALF TECHNOLOGIES	7	4	5.875	0.0	0.0
N	GENERAL DATACOMM INDS	7	4	5.75	-0.3	-4.2
N	GTE CORP	61	42	60.125	0.6	1.1
Q	INFOTRON SYS CORP	13	9	9.25	0.3	2.8
N	ITT CORP	65	48	60.25	-0.9	-1.4
N	M A COM INC	10	6	6.875	-0.1	-1.8
Q	MCI COMMUNICATIONS CORP	45	19	43.875	1.4	3.2
N	NETWORK EQUIPMENT TECH INC	27	14	25.875	-0.4	-1.4
Q	NETWORK SYS CORP	12	8	9.375	-0.3	-2.6
N	NORTHERN TELECOM LTD	23	14	20.25	-0.1	-0.6
Q	NOVELL INC	38	24	27.75	0.8	2.8
N	NYNEX CORP	84	65	80.875	1.9	2.4
N	PACIFIC TELESIS GROUP	47	29	45.875	1.0	2.2
A	PENRIL CORP	9	3	8	1.3	18.5
N	PLESSEY PLC	46	26	41.5	0.0	0.0
N	SCIENTIFIC ATLANTA INC	21	11	20.25	0.3	1.3
N	SOUTHWESTERN 8ELL CORP	58	39	56	2.4	4.4
Q	3 COM CDRP	29	12	13.5	-0.1	-0.9
N	U S WEST INC	74	55	70.25	1.3	1.8

Computer Systems

EXCH		52-WEEK RANGE		PRICE CLOSE SEPT. 20 1989	WEEK NET CHNGE	WEEK PCT CHNGE
Q	ALLIANT COMPUTER SYS	6	3	4.875	0.3	5.4
Q	ALPHA MICROSYSTEMS	8	5	6.625	-D.3	-3.6
Q	ALTOS COMPUTER SYS	9	6	6.75	-0.4	-5.3
A	AMOAHL CORP	23	14	15.5	0.0	0.0
Q	APPLE COMPUTER INC	50	34	44.625	-0.4	-0.8
N	BOLT 8ERANEK & NEWMAN	17	7	7.75	-0.3	-3.1
N	COMPAQ COMPUTER CORP	102	51	88.125	-3.8	-4.1
N	COMMOOORE INTNL	20	9	9.5	0.1	1.3
Q	COMPUTER AUTOMATION INC	7	3	2.75	0.0	0.0
N	CONTROL OATA CORP	24	16	18.625	0.6	3.5
Q	CONVEX COMPUTER CORP	15	7	13.25	-1.0	-7.0
N	CRAY RESH INC	75	41	42.25	-0.6	-1.5
Q	DAISY SYS CORP	9	3	3.875	0.0	0.0
N	DATA GEN CORP	21	14	15.125	-0.4	-2.4
N	DATAPOINT CORP	6	3	5.5	-0.1	-2.2
Q	DELL COMPUTER CORP	13	6	6.875	0.0	0.0
N	DIGITAL EQUIP CORP	122	86	96.875	-0.6	-0.6
N	FLOATING POINT SYS INC	4	2	1.75	-0.3	-12.5
N	HARRIS CORP	38	25	37.5	2.1	6.0
N	HEWLETT PACKARO CO	62	46	51.5	0.6	1.2
N	HONEYWELL INC	92	57	84.25	-1.0	-1.2
N	IBM	131	106	116	0.6	0.5
Q	INFORMATION INTL INC	16	12	13.875	-0.4	-2.6
Q	IPL SYS INC	9	3	7	0.1	1.8
N	MAI BASIC FOUR INC	19	3	3.375	-0.6	-15.6
N	MATSUSHITA ELEC INDL LTO	204	158	159.75	0.5	0.3
Q	MENTOR GRAPHICS CORP	22	12	19.75	1.3	6.8
N	N8I INC	3	1	1.625	0.0	0.0
N	NCR CORP	67	51	60.5	-3.5	-5.5
N	PRIME COMPUTER INC	21	9	9	-0.6	-6.5
Q	PYRAMIO TECHNOLOGY	20	9	13.25	-0.5	-3.6
Q	SEQUENT COMPUTER SYS INC	35	14	34	1.1	3.4
Q	SHARE8ASE CORP	4	1	1.5	-0.1	-4.0
Q	SILICON GRAPHICS CORP	24	14	23	0.3	1.1
Q	STRATUS COMPUTER	35	21	24.25	-9.5	-28.1
Q	SUN MICROSYSTEM INC	23	13	16.375	0.4	2.3
Q	SYMBOLICS INC	3	1	1.563	-0.2	-10.7
N	TANOEM CDMPUTERS INC	24	13	22.25	-1.4	-5.8
N	TANOY CORP	49	38	47.375	0.9	1.9
N	ULTIMATE CORP	13	7	9.625	-0.4	-3.8
N	UNISYS CDRP	33	20	20.125	-0.6	-3.0
A	WANG LABS INC	11	5	5.625	-0.3	-4.3

Software & DP Services

EXCH		52-WEEK RANGE		PRICE CLOSE SEPT. 20 1989	WEEK NET CHNGE	WEEK PCT CHNGE
Q	AOO8E SYS INC	30	18	19.75	-2.3	-11.4
Q	AOVANCED COMP TECH	4	1	1.469	0.0	0.0
Q	AMERICAN MGMT SYS INC	19	11	13.125	-0.1	-0.9
Q	AMERICAN SOFTWARE INC	20	9	17.75	-1.9	-9.6
N	ANACOMP INC	10	5	5.375	-0.3	-4.4
Q	ANALYSTS INTNL CORP	20	7	19.625	-0.6	-3.1
Q	ASHTON TATE	28	11	11.875	-0.1	-1.0
Q	ASK COMPUTER SYS INC	18	8	8.5	0.1	1.5
N	AUTO OATA PROCESSING	45	36	44.625	0.5	1.1
Q	AUTODESK INC	42	23	39	-2.3	-5.5
Q	BMC SOFTWARE INC	25	8	23.75	-0.1	-0.5
Q	BOOLE & BABBAGE INC	20	9	15.125	1.3	9.0
N	BUSINESSLAND INC	15	10	12.75	0.3	2.0
Q	COGNOS INC	9	5	5.375	-0.4	-7.0
N	CDMPUTER ASSOC INTL INC	22	13	16.375	-0.8	-4.4
Q	COMPUTER HDRIZONS CORP	10	7	7.125	0.0	0.0
N	COMPUTER SCIENCES CORP	56	44	51.5	-1.6	-3.1
N	COMPUTER TASK GROUP INC	17	11	11.5	0.8	7.0
Q	COMSHARE INC	40	18	37.75	-1.8	-4.4
Q	CORPORATE SOFTWARE	16	9	13.25	-0.5	-3.6
N	GENERAL MTRS (CLS E)	56	39	54.875	-0.3	-0.5
Q	HOGAN SYS INC	7	4	5.625	-0.4	-6.3
Q	INFORMIX CORP	12	7	10.375	0.5	5.1
Q	INTELLICORP INC	5	3	4.75	0.5	11.8
Q	KEANE INC	19	7	18	0.0	0.0
Q	LEGENT CORP	31	16	28	-1.3	-4.3
Q	LOTUS OEV CORP	29	15	27	-1.0	-3.6
Q	MANAGEMENT SCI AMER	12	6	10	-0.4	-3.6
Q	MICROSOFT CORP	65	45	65	2.8	4.4
Q	NATIONAL DATA CORP	35	19	31.5	-1.8	-5.3
N	ON LINE SOFTWARE INTL INC	8	4	7.75	0.3	3.3
Q	ORACLE SYS CORP	21	7	20.875	1.0	5.0
N	PANSOPHIC SYS INC	18	12	15.5	0.5	3.3
Q	PHOENIX TECHNOLOGIES INC	19	4	4.25	-0.3	-5.6
Q	POLICY MANAGEMENT SYS CORP	37	22	34.5	1.3	3.8
Q	PROGRAMMING & SYS INC	20	13	18.75	-0.8	-3.8
Q	RABBIT SOFTWARE INC	3	1	0.8125	0.0	0.0
Q	RELATIONAL TECH INC	16	8	8.5	0.4	4.6
N	REYNOLOS & REYNOLDS CO	34	20	25.875	-1.0	-3.7
Q	SAGE SOFTWARE INC	10	6	7.75	-0.1	-1.6
Q	SEI CORP	20	16	19.125	-0.3	-1.3
Q	SHAREO MEO SYS CORP	20	14	15.875	-0.4	-2.3
Q	SOFTWARE PU8G CORP	29	16	21.625	-2.6	-10.8
A	STERLING SOFTWARE INC	9	5	7.938	0.2	2.4
Q	SUNGARO DATA SYS INC	21	13	19.25	-1.3	-6.1
Q	SYSTEMATICS INC	38	26	36	-2.3	-5.9
N	SYSTEM CENTER INC	26	14	21.875	0.4	1.7
N	SYS. SOFT INC	30	13	28.5	-1.3	-4.2
Q	WORDSTAR	3	2	1.938	0.3	14.8

Semiconductors

EXCH		52-WEEK RANGE		PRICE CLOSE SEPT. 20 1989	WEEK NET CHNGE	WEEK PCT CHNGE
N	AOV MICRO DEVICES INC	12	7	8.5	-0.5	-5.6
N	ANALOG DEVICES INC	13	10	9.875	-0.1	-1.3
Q	ANALOGIC CORP	11	7	10.75	0.0	0.0
Q	CHIPS & TECHNOLOGIES INC	26	11	19.25	-1.3	-6.1
Q	INTEL CORP	34	19	31.25	0.1	0.4
Q	LSI LOGIC CORP	12	7	7.25	-1.4	-15.9
Q	MICRON TECHNOLOGY INC	26	13	13	-1.3	-8.8
N	MOTOROLA INC	62	36	57.375	-0.5	-0.9
N	NATL SEMICONDUCTOR	11	7	7.75	-0.1	-1.6
N	TEXAS INSTRS INC	47	35	39.875	-0.3	-0.6
A	WESTERN OIGITAL CORP	15	8	8.125	-0.8	-8.5

Peripherals

EXCH		52-WEEK RANGE		PRICE CLOSE SEPT. 20 1989	WEEK NET CHNGE	WEEK PCT CHNGE
Q	ALLOY COMP	4	1	2.375	0.1	5.6
N	AM INTL INC	6	5	5.25	-0.3	-4.5
Q	AST RESH INC	10	7	8.75	0.1	1.4
Q	AUTO TROL TECH CORP	6	4	4.25	0.1	3.0
Q	BANCTEC INC	18	8	17.75	-0.4	-2.1
Q	CIPHER DATA PRODS INC	11	7	7.5	-0.1	-1.6
A	COGNITRONICS CORP	7	2	6	0.0	0.0
Q	CONNOR PERIPHERALS	15	7	12.125	-0.4	-3.0
A	DATAPROOUCTS CORP	18	9	9.25	-0.1	-1.3
A	DATARAM CORP	12	7	9.25	-0.8	-7.5
N	EASTMAN KODAK CO	52	42	47.625	-1.1	-2.3
N	E M C CORP MASS	6	3	4.625	-0.1	-2.6
Q	EMULEX CORP	12	7	7.875	-0.1	-1.6
Q	EVANS & SUTHERLANO	25	13	22.875	-0.8	-3.2
Q	ICOT CORP	3	1	1.625	0.1	8.3
Q	INTERLEAF INC	11	6	6.75	0.0	0.0
Q	IOMEGA CORP	5	2	2.75	-0.1	-2.2
Q	LEE DATA CORP	4	2	2	-0.1	-5.9
Q	MASSTOR SYS CORP	4	2	2.75	-0.4	-13.7
Q	MAXTOR CORP	12	6	11.25	-0.4	-3.2
Q	MICROPOLIS CORP	11	3	3.875	0.0	D.0
Q	MINISCRIBE CORP	9	1	1.875	0.1	7.1
N	MINNESOTA MNG & MFG CO	80	35	73.875	-0.6	-0.8
Q	PERSONAL COMP PROOUCTS INC	6	4	4.125	0.1	1.5
Q	PRIAM CORP	2	0	0.281	0.0	0.0
Q	PRINTRONIX INC	11	7	8.5	0.0	0.0
N	QMS INC	12	6	11	0.3	2.3
Q	QUANTUM CORP	16	4	14	-1.3	-8.2
N	RECOGNITION EQUIP INC	13	6	6.625	-0.1	-1.9
Q	REXON INC	8	6	7.375	0.0	0.0
Q	SEAGATE TECHNOLOGY	16	7	12.25	-0.8	-5.8
N	STORAGE TECH CORP	23	9	12.625	2.4	23.2
Q	TANOON CORP	2	0	0.938	0.1	15.4
N	TEKTRONIX INC	24	19	19.5	-0.9	-4.3
Q	TELEVIOEO SYS INC	1	0	0.688	0.0	-4.3
N	XEROX CORP	69	54	65	-1.3	-1.9

Leasing Companies

EXCH		52-WEEK RANGE		PRICE CLOSE SEPT. 20 1989	WEEK NET CHNGE	WEEK PCT CHNGE
Q	AMPLICON INC	115	11	13.75	0.3	1.9
N	CAPITAL ASSOC INTNL INC	9	5	6.625	-0.4	-5.4
N	COMDISCO INC	33	19	32.625	1.5	4.8
Q	CONTINENTAL INFO SYS	5	0	0.75	0.1	9.0
Q	LOI CORPORATION	18	13	18	0.5	2.9
Q	PHOENIX AMERN INC	5	3	3.813	0.1	1.7
Q	SELECTERM INC	9	5	7.25	-0.3	-3.3

EXCH:N = NEW YORK;A = AMERICAN;Q = NATIONAL

Huge storm

Technology investors blink as SEC looks into Stratus shares

As Hurricane Hugo pounded the East Coast, technology issues were swamped by insider trading allegations and a challenge to desktop publishing's standard language. Gale warnings were raised by reports that three Stratus Computer, Inc. officials cashed in shares last month — before the minicomputer maker reported lower-than-expected third-quarter earnings last week. Seven other company officials have sold their shares since May, according to the Securities and Exchange Commission. Stratus plummeted 8¾ points to close Thursday at 24¾.

Rough weather also hit Adobe Systems, Inc., maker of the Postscript page-description language (PDL). Apple Computer, Inc. and Microsoft Corp. reported that they will team up to develop a PDL to rival Adobe's standard (see story page 6), sending the latter's stock skidding. Adobe closed at 15⅝, off 4⅞ points. Software Publishing Corp. fell 1¼ points to 22¼.

Storage Technology Corp. offered a calm port from the week's storms. The company was awarded a $1.7 million contract to supply the U.S. Air Force with robotic computer storage equipment. Storage Tek finished at 12⅝, up 2 points. Digital Equipment Corp. inched up ½ of a point to close at 98. IBM was also up slightly, finishing at 116⅛, up ⅝ of a point.

JOSEPH J. FATTON

Computers track Hugo's frenzy

BY MARYFRAN JOHNSON
CW STAFF

CORAL GABLES, Fla. — Back when it was just a cluster of clouds and a few churning waves off the western coast of Africa, Hurricane Hugo caught the eye of the National Hurricane Center.

By Friday morning, Hugo had grown powerful enough to pulverize Charleston, S.C., leaving in its wake 85% of the city powerless, 30 major buildings leveled and a 50-foot boat deposited in the middle of a city street.

As the mammoth storm developed during the past two weeks, a Geostationary Orbiting Environmental Satellite beamed digital images of the storm to an IBM mainframe at a federal facility in Wallops Island, Va. Within one second, the data was manipulated, rebroadcast via satellite and bounced back down to the antenna feeding into an IBM 4381, which was located at the hurricane center.

That is when Sylvia Graff and other meteorologists at the hurricane center spotted "that certain signature" warning them that a tropical cyclone was in the making.

Two weeks later, Hugo had blown up into a killer with winds gusting up to 140 miles per hour, devastating parts of Puerto Rico and the Virgin Islands before slamming into South Carolina.

Seat of the pants

Despite stunning advances in computer technology over the past decade — providing more accurate images and volumes of detailed data faster than ever before — meteorologists still rely to a certain degree on "seat-of-the-pants forecasting" when it comes to a deadly force like Hugo.

"It would be neat to say we crank in the numbers, and there it is. But it doesn't work that way," said Graff, a 20-year veteran in hurricane tracking.

Nevertheless, the tracking system provided enough warning for data centers in the Charleston area to prepare for the worst as early as Tuesday last week.

According to spokesmen at disaster recovery service firms Comdisco, Inc. and Sungard Recovery Services, Inc., at least 10 subscribers in the area put the services on official alert for potential disaster.

At least one Charleston data center reported serious water damage to the building and was expected to declare a disaster, according to Ray Hipp, president of Disaster Recovery Services at Comdisco.

"We've been in touch with our customers there, and so far, none have officially declared a disaster," Hipp said midday Friday. "But we expect to know more later and anticipate at least this one company to declare."

At Westinghouse Electric Corp. in Hampton, S.C., 70 miles from Charleston, MIS Manager Bob Boller battened down the hatches late Thursday afternoon by running a full system backup. He shut down the power on his Hewlett-Packard Co. 3000 Model 955 by 8 p.m. Westinghouse suffered no damage, according to Boller, who managed to fight his way to work Friday morning.

The newest software capabilities in weather analysis allow meteorologists to "make a movie" out of satellite data, playing it backward and forward to see which way the clouds are moving. This enables them to deduce the wind field and direction.

"The technology for acquiring [weather] data has not changed. What has changed is the technology for manipulating it," said Kerry Emanuel, a professor of meteorology at MIT. Advances in workstation technology have particularly helped in analysis of complex, four-dimensional data sets, he noted.

The hurricane center's technological base rests on one IBM mainframe, a Data General Corp. S140 Eclipse minicomputer and an eclectic collection of personal computers — running mostly software written in-house by National Oceanic and Atmospheric Administration scientists.

But the true heart of the operation is the Mcidas System, a meteorological data processing system designed by the University of Wisconsin's Space Science and Engineering Center.

Through the proprietary Mcidas preprocessor embedded in the IBM mainframe, the system receives and manipulates the staggering amount of data a weather satellite generates. A full globe image, at full resolution, takes up 225M bytes of memory.

Only this year did the hurricane center obtain its own mainframe and the first of four Mcidas workstations, allowing it to acquire satellite data locally rather than waiting for a remote mainframe in Virginia to pipe images — with agonizing slowness — down a 9.6K bit/sec. communications link.

Staff writer Richard Pastore contributed to this report.

Mac

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display technology slowed the developmental process.

The portable incorporates all the traditional Macintosh features into a trim carry-along size. The only hefty elements of the machine are its price and weight: Entry-level models sell for $5,799 and weigh 13¾ pounds, while a 40M-byte hard-drive version costs $6,499 and weighs 15¾ pounds.

Apple executives said those sacrifices were necessary. "We wanted no compromises, no Mac Jr.," said Jean-Louis Gassee, president of Apple Products, who added that trimming off a few pounds was less important than providing full Macintosh functionality.

Macintosh users agreed, saying that function was the most important element they were concerned with. "Yes, it's expensive, but a true portable Mac is really needed. Besides, it's peanuts if it can make a senior executive earning $150,000 a year more productive," said Rick Christjansen, manager of automation support at the Manville Corp. Technical Center in Denver.

Mike Bailey, systems integrator at Lockheed Missiles and Space Corp. in Sunnyvale, Calif., said the portable is better than what he is lugging around now. "Currently, I haul around an SE; it's too bulky but better than nothing," he said. "When you connect another portable to a Mac network, it seems like a waste of time."

Analysts downplayed the price and weight issues. "It's a very impressive portable, and Compaq has proven that users are willing to pay a few extra dollars for a fully functional machine," said Michele Preston, an analyst at Salomon Brothers, Inc., a research firm in New York.

Preston also speculated that the high cost of the machine may have been devised in order to avoid the possibility of the portable stealing sales away from lower priced Macintosh SE models.

The screen uses an active matrix LCD, which means that behind each pixel is a transistor. The screen can be viewed head-on or from either side and offers sharper images and less image bleeding than many other portables.

Instead of the Mac's traditional mouse, the portable uses an integrated trackball that can be positioned on either side of the keyboard to accommodate left- or right-handed users. An optional mouse is also available.

A 1M-byte static random-access memory chip taps into a sealed lead-acid battery — the same technology used in automobiles — and provides up to 12 hours of power. A built-in modem is also included.

The Mac IICI is a high-powered extension of the IICX which has become the fastest selling product in Apple's product family since its introduction in March. The IICI runs at 25 MHz and offers such new capabilities as built-in video. Pricing begins at $6,269.

The IICI also further blurs the dividing line between personal computers and workstations and gives Apple users a leg up in power.

"With the 16-MHz IICX and 25-MHz IICI, Apple users have the same kinds of performance choices as do the Intel processors users," said Andrew Seybold, president of Andrew Seybold's Computer Insiders in Santa Clara, Calif. "[The Motorola Corp.] 68030 running at 25 MHz will perform as well if not better than the 80386 running at 33 MHz."

Apple officials claim both machines have already received a warm welcome from users. Allen Loren, president of Apple USA, said the Cupertino, Calif.-based company has received 20,000 orders for both machines, representing $100 million in revenue.

Pack a Mac

Apple's Macintosh portable features a built-in trackball pointer and a hefty weight and price

Processors:
- Motorola CMOS 68000, 16MHz

Power:
- Lead acid batteries, 6-12 hours

Display:
- Active matrix LCD, 640 x 400

Memory:
- 1 M-byte RAM

Storage:
- 1.4M-byte diskette; 40 M-byte hard drive optional

Weight:
- 15.7 lbs. with battery and hard disk

Price:
- $5,799; $6,449 with hard disk

SOURCE: APPLE COMPUTER, INC
CW CHART: JOHN YORK

Telecom forum offers users tailoring options

BY ELISABETH HORWITT
CW STAFF

SAN DIEGO — This week's Tele-Communications Association '89 conference could lend a hand to the communications manager whose budget belt has been tightened of late.

Several announcements expected at the show were designed to give users more options for tailoring communications offerings to the needs of a given site — and then integrating those offerings under one management system.

Among the more prominent products and services expected to be introduced at the show are the following:

- U.S. Sprint Communications Co. is expected to announce general availability of its Clearline Fractional 1.5 service, which targets sites that can cost-justify several 56K bit/sec. channels but not full T1.
- AT&T Paradyne is slated to announce a network management system that provides users with a foundation for integrating AT&T's and Paradyne's respective data communications product lines, according to the AT&T subsidiary's executive vice-president, John Miller.

The 6800 series is a windowed, graphics-driven system that is said to monitor, collect statistics from and configure AT&T and Paradyne modems, multiplexers and channel service units. The 6800 is also said to manage Paradyne's host channel extender units via a terminal interface.

No people

The 6800 will use AT&T's Network Management Protocol to automatically upload configuration changes to the Accumaster Integrator's database as they happen without human intervention, he added.

The 6800 runs on an AT&T workstation based on the Intel Corp. 80386 chip or 3B2 minicomputer and is priced between $20,000 and $100,000 or more. Availability is scheduled for the first quarter of next year.

- Bytex Corp. is scheduled to introduce its Remote Center Management, an IBM Personal Computer-based system that is said to provide centralized management functions such as test initiation and performance monitoring to Bytex matrix switches at remote sites.

Bytex is also expected to announce Unity Digital Network Switch, a T1 networking switch that reportedly supports fractional T1.

- Telematics International, Inc. is expected to announce what may be the first software package to allow intelligent interconnection between carrier-based and private packet-switched networks. This would allow functions such as security, filtering, call validation and intelligent routing to be implemented across a hybrid network.

Other developers will play, too

BY AMY CORTESE
CW STAFF

Although only three computer-aided software engineering (CASE) vendors shared center stage with IBM's AD/Cycle, there were no hard feelings evident from the rest, as more than 20 companies joined in with a resounding, "Me, too," pledging support for AD/Cycle and promising OS/2-based tools.

AD/Cycle, and more specifically the Repository Manager, vendors said, give the industry standards on which to base development efforts.

"With IBM putting its muscle behind CASE, we'll see some standards set and the CASE market start to bloom," predicted Richard Ward, president of worldwide marketing at On-Line Software, Inc. "De facto standards help both vendors and users," agreed Michael Watters, manager of Texas Instruments, Inc.'s Advanced Information Management.

However, there was uncertainty as to what exactly those standards are and when more detailed information will be forthcoming from IBM.

In the near term, the two most accessible targets for developers are IBM's specifications for its Common User Access and the OS/2 platform, Watters said. But vendors were unclear as to when the information model — which applications working with the repository will use — would be finalized.

Glover Ferguson, director of development for Andersen Consulting's CASE product, Foundation, said there may be some portions of the model out in June, when the repository is scheduled to ship, but that IBM was vague about what would be included in the first release.

In the meantime, CASE vendors with repository-like products of their own said they intend to continue using them with an eye toward migrating to the Repository Manager when it is available.

Ferguson said his company will give customers the option of using its own repository or IBM's until Repository Manager is "at least as functional as our own." However, he added, "We don't have assurance that will be in June." When that time does come, Andersen will provide a migration from its proprietary repository to IBM's.

Ferguson said the Foundation tools go through access services to reach the repository, so it would be a matter of rewriting them to work with IBM's repository without requiring changing the tools themselves.

While most vendors conceded the repository to IBM, many stressed that their offerings in other areas are competitive with, and in many cases way ahead of, IBM's.

"I was looking for a strong repository because I want to use that, and I was hoping [the announcement] would not be too overwhelming," Ferguson said of his expectations of last week's announcement. "I got half of my wish," he quipped.

Ferguson characterized TI's integrated CASE offering as a "strategically equal alternative to AD/Cycle." Similarly, Gary Greenfield, executive vice-president of product development at Sage Software, Inc., said that while IBM's Cross-System Product focuses on a least common denominator approach to generate code for multiple IBM environments, Sage's tool generates native Cobol code optimized for the particular environment.

Judging from user reaction, AD/Cycle is opening opportunities for all CASE vendors, not just those on the inner fold.

John Voss, vice-president of systems integration at Huntington Service Co., a division of Huntington Bancshares, Inc. in Columbus, Ohio, said he missed the IBM customer meeting because he wanted to be around when a major new on-line banking system using TI's Information Engineering Facility tools went on-line.

While Voss said he is considering products from Bachman Information Systems, Inc., one of IBM's CASE partners, the decision is based on the products themselves and not because IBM chose them.

Likewise, William McClatchie, manager of Information Resource Management at G.E. Plastics in Pittsfield, Mass., was disappointed with IBM's announcement. He said he will look at other third-party offerings: "Our wait-and-see attitude prior to the announcement is becoming more of a look-elsewhere attitude."

Supporting cast

IBM's AD/Cycle includes a number of supplementary development tools

Product	Availability
Developmate • Business modeling and prototyping tool	**December '90**
Software Analysis Test Tool • Verification and validation tool	**June '90**
Workstation Interactive Test Tool • Automatically records and replays interactive application test sessions	**March '90**
Data Extract/D1 • Extracts data from a DEC VMS system and moves it to an IBM system	**March '90**
Dictionary Model Transformer • Transfers information from IBM OS DB/DC Data Dictionary to Repository Manager/MVS	**June '90**

SOURCE: IBM

CW CHART: JOHN YORK

Baxter, IBM merge in health care

BY ELLIS BOOKER
CW STAFF

The $6 billion market for health care information products and services welcomed the delivery of a new baby last week.

IBM and Baxter Healthcare Corp. in Chicago announced a 50-50 partnership merging their separate health care information operations. The new, as-yet-unnamed company will focus on the needs of a broad spectrum of customers, from doctors' offices to large, multibuilding medical centers and it will offer enterprisewide and department-level computing products, said Frank Russo Jr., former head of Baxter's Systems Division. He will become president and chief executive officer of the new company.

The partnership calls for Baxter to contribute its Systems Division, which has been responsible for marketing software and services to large hospitals, and its physician computer systems. Some 800 Baxter employees will join the new enterprise.

IBM will contribute its existing line of health care-specific applications systems. IBM also will open four "health industry solution centers" across the country — in Washington, D.C., Dallas, Chicago and Los Angeles — to aid the new entity's independent marketing force, which will work in concert with IBM's worldwide field marketing force.

"Baxter has been a business partner of IBM for years as a remarketer of IBM hardware, and frankly we've been attempting to improve the relationship," Russo said. He added that IBM provides "marketing leverage" and the ability to cooperate on future products that address research-and-development-intensive clinical systems. In addition, IBM affords Baxter "a worldwide sales force," he said.

The merger is significant in the health care industry, which just six months ago saw the sale of McDonnell Douglas' health care group to American Express, said Sheldon I. Dorenfest, president of Sheldon I. Dorenfest & Associated Ltd., a Northbrook, Ill., health care consultancy. The problem, Dorenfest said, has been that suppliers of health care information systems "have been deviating" from the products the marketplace is demanding, particularly integrated solutions. He said the necessary R&D investment to fix existing product lines while bringing out new products is too high for many players.

IBM tosses in upgraded 4GL to mixed reviews

BY ROBERT MORAN
CW STAFF

As part of its AD/Cycle strategy, IBM introduced an upgraded Cross-System Product (CSP), revamping its disdained fourth-generation language (4GL) by turning it into a code generator.

According to Aaron Werman, president of Data Definitions, Inc., a New York consultancy specializing in DB2, IBM finally has a legitimate 4GL for the first time. "For the next two years, there will be a bloodbath pointed at other products on the market," he said.

CSP Version 3 Release 3, scheduled to be available in June 1990, runs on a programmable workstation, providing a graphical interface that supports application definitions. It also provides an external source format in which to hook vendor tools.

IBM also introduced CSP/370, which generates VS Cobol II application programs using the application definition function of CSP.

Bill Werbin, vice-president of wholesale information systems development at Manufacturers Hanover Trust in New York, said that although IBM announced CSP and CSP/370 for Cobol generation, it did not announce when it will link CSP to its repository product.

Nevertheless, Werbin said he was encouraged by the announcement because he is a CSP user. "I limited my use of CSP to low-volume transaction processing functions," he said. "The benefits in terms of development are there, but CSP contains overhead when executing it in production environments."

Other analysts gave CSP a mixed review. Jeff Tash, president of Database Decisions, Inc., a consultancy in Andover, Mass., said the "product is terrible," because "the Cobol piece will work only with IMS/DC and is an inappropriate tool for building cooperative processing applications."

However, Werman said CSP will now be able to move from its status as a tool for the VM operating system and small mainframes to use on IBM 3090s.

Further integration

CSP still needs to be integrated with IBM's other facilities, Werman said. At present, the tool's import/export facilities will permit CSP to retrieve a low-end design from one of the supplied tools. After developers fill the rough design with, for example, logic to drive screens, CSP will generate the application.

It will take two to three years for CSP to be integrated with the repository, said Adam Rin, an analyst in the Software Engineering Service at Gartner Group, Inc. Additionally, he said, "It will take three to four years before CSP is ported to all SAA platforms, and it may take more than five years before CSP supports multivendor connectivity."

Independent software developers downplayed the IBM announcement. Abbey Pinard, marketing director at Must Software International, Inc., said the selection of CSP or Nomad will depend on how organizations want to do applications development. "Many organizations will use CSP, but the same companies will also use a product like Nomad for different kinds of applications and different users," she said.

Howard Winer, vice-president of marketing and sales support at Software AG North America, Inc., said he does not perceive CSP as a threat, adding that by making CSP a Cobol generator, IBM is taking customers back to a third-generation language.

AD/Cycle

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building, designing, testing, producing and maintaining applications. However, analysts said that IBM is addressing only business modeling functions and that the theoretical scaffolding will not be enough for some users.

Observers said the announcement signals IBM's stamp of approval for computer-aided software engineering (CASE) technology to tackle the backlog and sets the stage for years of technological innovation and product announcements.

Bill Werbin, vice-president of wholesale information systems development at Manufacturers Hanover Trust in New York, said he was encouraged by the announcement, particularly by IBM's partnership with Bachman Information Systems, Inc. and Index Technology Corp., but that he was "still disappointed with the status of the repository." He said the release will have limited functionality and will not address the entire applications life cycle. "While IBM has addressed business modeling," he said, "they have yet to address requirements, design and code generation in the repository."

Wheeler, *vice-president and general manager of programming systems*

Athough IBM was not specific about when it will address the entire life cycle, Werbin said he looks forward to linking the whole life cycle to a central repository.

According to IBM, Repository Manager/MVS Version 1, Release 1 will become available next June and include a common programming interface to MVS/ESA and MVS/XA as well as an interface to entity relationship and object services tools provided by itself and its three business partners.

Prices are based on IBM processor groups and range from a onetime charge of $94,080 to $243,000.

Analysts painted AD/Cycle as a mainframe announcement, falling short of its proposed reach to all SAA platforms and lacking a specific schedule for when it will become available for both the VM environments and OS/400.

Further-reaching goals were cited by IBM officials, but in the vague scheduling phraseology that has come to characterize SAA announcements. "Over time, most of the 700,000 lines of code will move over to VM unchanged," said Earl Wheeler, IBM's vice-president and general manager of programming systems.

Last week, IBM announced 21 new or enhanced tools and services and enlisted the service of three business partners to provide OS/2 Extended Edition versions of their product designed to anchor AD/Cycle development at desktop devices:

- Bachman will provide a series of knowlege-based tools, the the Bachman/Re-Engineering product set, to help with DB2 database designs.
- Index Technology will offer the Excelerator series for systems planning, analysis and design for customizing an organization's development environment.
- Knowledgeware, Inc. will provide the Information Engineering Workbench, a set of tools for automating the planning, analysis and design for high-level languages and IBM's Cross-System Product, the company's enhanced applications generator and fourth-generation language (see story page 140).

Among the announcements, IBM also introduced Data Extract/D1, which allows users to extract data from Digital Equipment Corp. VMS systems for moving to IBM systems.

Further, the company has added implementation support for AD/Cycle with the assistance of four service providers: CAP Gemini America, Computer Power Group, Computer Task Group and GE Consulting.

"What IBM announced is only the beginning," said George DiNardo, executive vice-president of information management and research at Mellon Bank NA in Pittsburgh. "Toward that end, I am happy that they haven't delayed the repository again. But I want to begin to play with it and see what it does."

PHOTOS BY JERRY VALENTE

George Conrades *describes the AD/Cycle strategy*

DiNardo said he is excited about tools for restructuring and specification coding but added that until the repository arrives, his vision of having a core of programmers at a central site with other programmers in business units hinges on the repository.

In addition to concerns over the repository, observers said it is still unclear how three incompatible CASE systems will work together. When the repository becomes available, products for Knowledgeware, Bachman and Index Technologies will still have their own dictionaries.

Aaron Werman, president of Data Definitions, Inc., a New York consultancy specializing in DB2, said the three companies have different views about what a business model looks like, although it is assumed it will be based on Knowledgeware's model.

Shaku Atre, a partner with Coopers & Lybrand's Atre Computer Assistance division in Rye, N.Y., added that IBM's announcement assumes that everybody has started from scratch. "IBM has not stated how it will transfer all the information that is in existing dictionaries," she said.

Werman added that "it will take at least three years before the repository will start fitting things together." Beyond that, he said, "It will be at least five years before applications can actually interconnect."

Charles Dietz, manager of data administration for pensions, savings and retail at Metropolitan Life Insurance Co. in New York, said that the only thing that has changed is that he now has a delivery date. "I still don't have information on what the data model will be."

Lotus invests in Sybase to fuel midrange move

BY PATRICIA KEEFE
CW STAFF

CAMBRIDGE, Mass. — Lotus Development Corp. last week unveiled a surprise alliance with Sybase, Inc. that netted the spreadsheet leader a 15% minority ownership in the database engine supplier.

The deal is expected to bolster both companies' presence in the midrange area while strengthening a Lotus bid to extend its core business into the heart of corporate America — the database market.

"Today, front-end software for Lotus is thought of as being spreadsheets. We want to broaden that focus," said David Gilmure, Lotus vice-president of database systems.

A similar alliance between Lotus and Oracle Corp. has long been rumored. However, one industry source said that when the two were not able to strike a deal, Lotus turned to Sybase. "The technology is first-rate and fits us better than would any other partner," Gilmure said.

Moreover, "it gives Lotus possibly the largest single ownership position in a company that holds the keys to Microsoft's SQL Server and Ashton-Tate's high-end database future," said Richard Shaffer, publisher of the newsletter "Computer Letter."

The investment is key to efforts to provide Lotus spreadsheet users with access to diverse sources of data, Lotus executives said. It is also Sybase's first venture with a front-end tool supplier.

Lotus joins Apple Computer, Inc., Next, Inc. and Ashton-Tate Corp. as investors in Sybase. Apple reportedly owns less than 8%, and Ashton-Tate's share is said to be less than 5%.

An option to buy up to another 10% in the company over the next 10 years, would make Lotus the largest shareholder in Sybase, said by Shaffer to be one of the fastest growing database companies today.

Details on product plans were fuzzy. The alliance encompasses joint development, marketing and distribution provisions for future products. The two partners will work together to ensure that Lotus applications exploit the capabilities of Sybase's SQL Server technology, starting with 1-2-3 Release 3.0. The latter was demonstrated at Networld earlier this month running under SQL Server. No ship date has been disclosed.

Lotus and Sybase remained mum on the financial aspects other than to say that it will not negatively affect Lotus' bottom line. The agreement also put Frank King, senior vice-president of Lotus' software products group, on the Sybase board of directors.

The Lotus investment in Sybase adds even more weight to the considerable industry support already built up behind the Microsoft/Ashton-Tate/Sybase SQL Server technology.

Concurrently, this wellspring of support is expected to go a long way toward solidifying the comfort factor for information systems managers trying to choose between the $50 million Sybase and its rival, the $500 million Oracle, said Richard Finklestein, a database consultant and partner in Performance Computing, Inc. "It sends a strong message, and it's clearly something that Oracle will have to deal with," said Adrian King, general manager of Microsoft's Work Group Services business unit.

From a desktop perspective, the alliance is seen as further strengthening Microsoft Corp.'s SQL Server strategy and, subsequently, its drive to establish OS/2. Many industry observers believe that Microsoft sees SQL Server as "the great white hope" of OS/2. "We think it's great," King said. "Like the ad says, they like it so much that they bought the company. It's a great endorsement for SQL Server."

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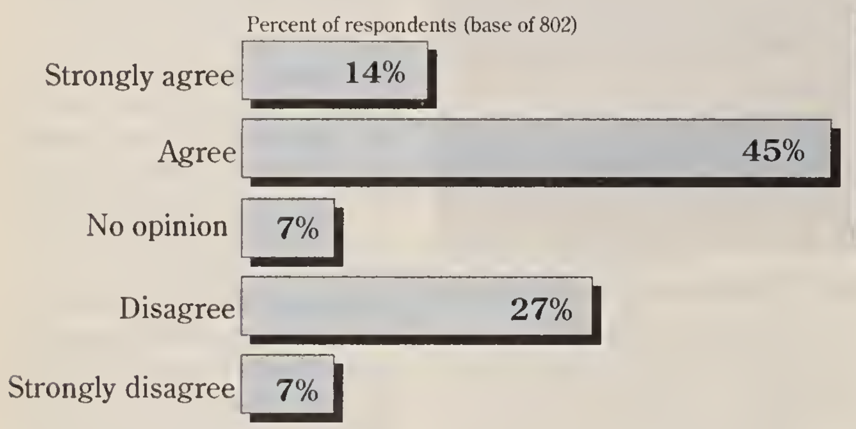
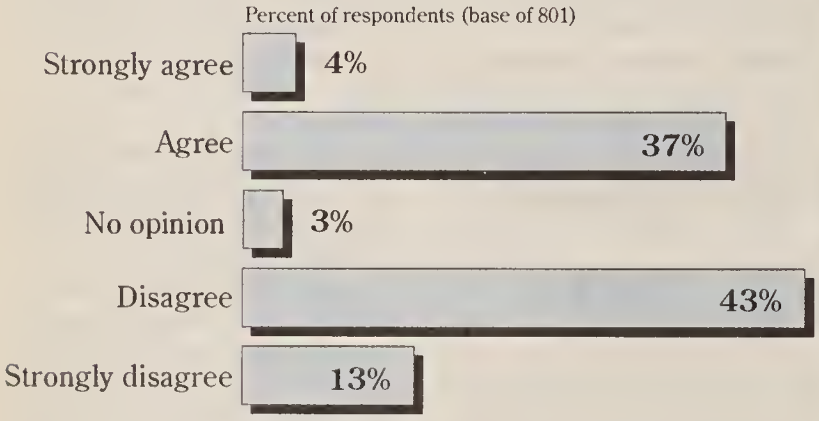
TRENDS

JOB SATISFACTION SURVEY

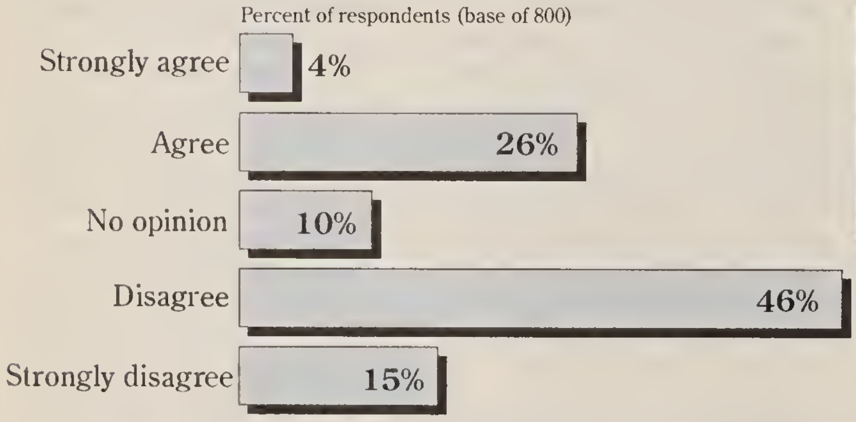
Most IS professionals say information systems is regarded as a critical part of their organizations but that it's insufficiently staffed and ill-funded



"Management views IS as important to the strategic position of the company."



"My IS department is adequately staffed."



"We always have enough money budgeted to do the job well."

SOURCE CW JOB SATISFACTION SURVEY

CW CHARTS: JOHN YORK

NEXT WEEK

Bill Crowell of ▶ McGraw-Hill's F.W. Dodge Division believes that IS should be an active partner in the initiation and development of business endeavors. This isn't just a theory; it is something Crowell has tried to do from within an information systems division and as a non-IS executive in a business unit. Read about it in Executive Report.

ANDY FREEBERG

IBM's new chief of science and technology says that although that company has slipped from first to eighth in world patents, aggressive ongoing research and development guarantees that "you ain't seen nothing yet." John Armstrong elaborates on the firm's technology directions and plans in an interview that will appear in In Depth.

INSIDE LINES

Feds finally worried

NASA is vexed about reports that the Columbus Day (also called the Datacrime) and Friday the 13th viruses are primed to strike PCs on Oct. 12 and 13. The shuttle *Atlantis*, which is carrying the Galileo satellite on a mission to Jupiter, is slated to lift off Oct. 12. There is "more than a modicum of concern" at NASA that a virus outbreak could interfere with the launch, according to Winn Schwartau, president of America Computer Security Industries (ACSI) in Nashville. Schwartau said that NASA and several other government agencies in recent weeks have purchased some 20,000 copies of ACSI's Vchecker software, designed to rid infected PCs of Datacrime and other viruses. Officials at Johnson Space Center in Houston, however, did not return calls seeking comment.

IBM finally serious?

IBM will hold a "major" Micro Channel Architecture (MCA) announcement tomorrow in New York, hosted by Robert Carberry, the MCA man in the know. The briefing is expected to detail advanced MCA capabilities promised when IBM first announced MCA. Related products should follow shortly.

Riding into the Sun-set

While Sun continues to gain Sparc licensees, there are persistent rumors that AT&T has second thoughts about building Sparc-based systems. Development of such systems is said to have been on hold for months while AT&T engineers evaluated Motorola 88000 and Intel I860 and 80486 chips. Although many have expressed interest in the RISC architecture, only Sun and Solbourne have shipped Sparc-based systems.

An impartial judge

DEC has officially responded to Adapso's requests to reverse its bundling of runtime RDB with the VMS operating system, according to a DEC spokeswoman. In a letter sent to Adapso, DEC "refused the concerns" of the vendor council, stating that there was no evidence given to suggest that the packaging of RDB is unfair practice. Adapso will discuss whether to pursue the matter at a meeting next week.

Praise from the enemy?

When asked about the future role of the mainframe at last week's *Business Week* symposium of IS executives, AT&T Computer Systems President Gordon J. Bridge sounded a conciliatory note toward the competition. "I actually think IBM's Officevision is a good articulation of that, with the mainframe as the repository of data," he said. Bridge joined AT&T last year after a 19-year career at a well-known vendor based in Armonk, N.Y.

Benchmark Wars III

We lived through Benchmark Wars I (the mainframes) and Benchmark Wars II (the minicomputers). But can we stomach yet another battle? The vendors don't care, because Benchmark Wars III (the servers) is out of production and coming to a press release near you. Hot on the heels of a benchmark for Microsoft and Ashton-Tate's SQL Server is Gupta Technologies with an SQL benchmark that reportedly goes further.

Technology marches on

The latest government procurement: a Morale Welfare and Recreation Market Analysis and Program Planning System. The Orkand Corp. in Silver Springs, Md., netted a one-year contract with four option years to develop a system for Army use in management of "quality of life" operations such as officer's clubs, golf and bowling. In light of Congressional budget-cutting action, according to a press release, MWR programs are under pressure to improve return on investment.

The Great Kahn has been toned down, at least in media descriptives. A man-on-the-street column in The Santa Cruz Sentinel *featured Philippe responding to a query about recent rains out West. But the chief of Borland was described merely as "Entrepreneur, Scotts Valley." Not a very hefty title for the man who would be spreadsheet king. One of our readers just thought you should know. If you have something just as enlightening, call News Editor Pete Bartolik at 800-343-6474 or 508-879-0700.*

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